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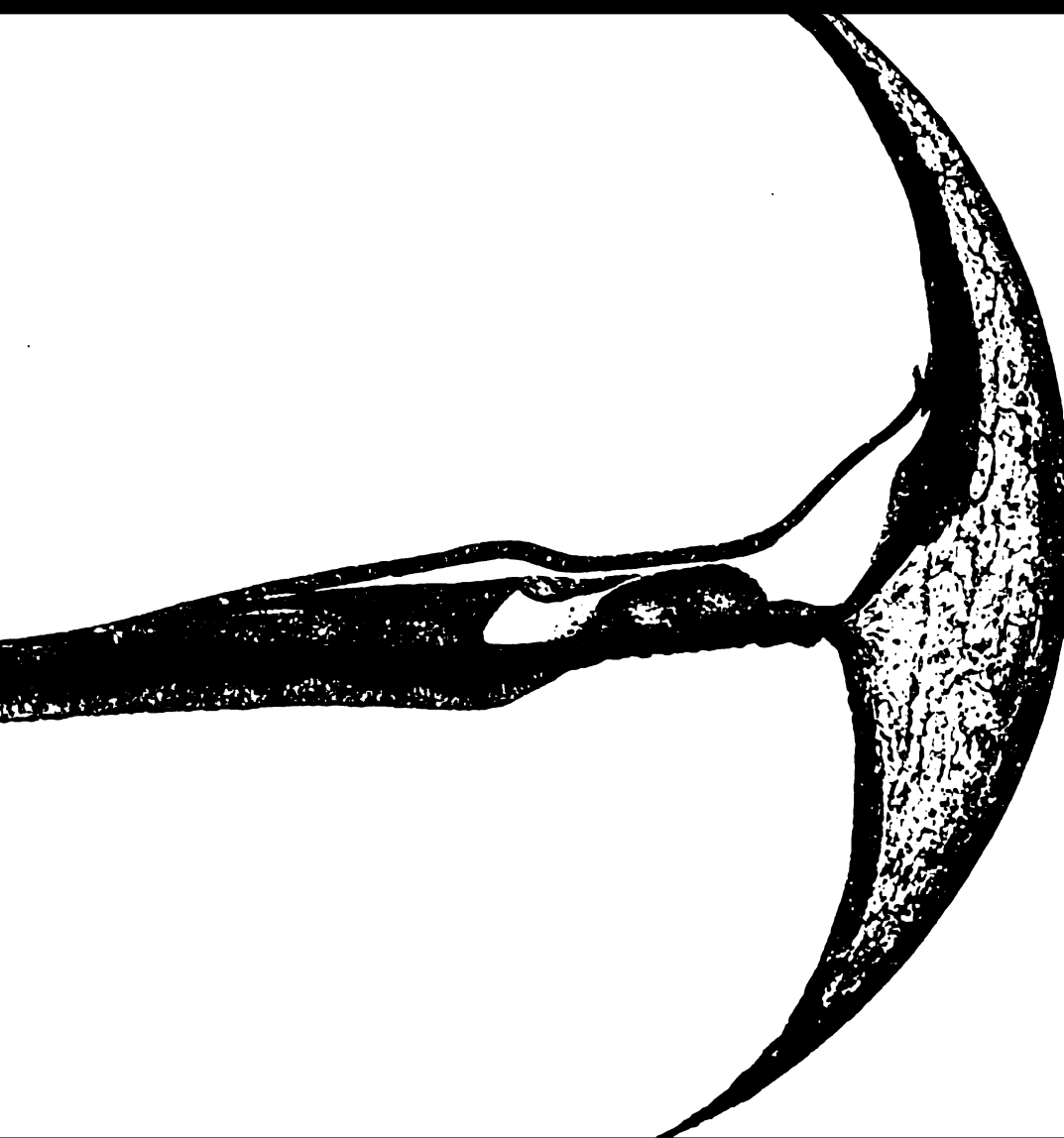
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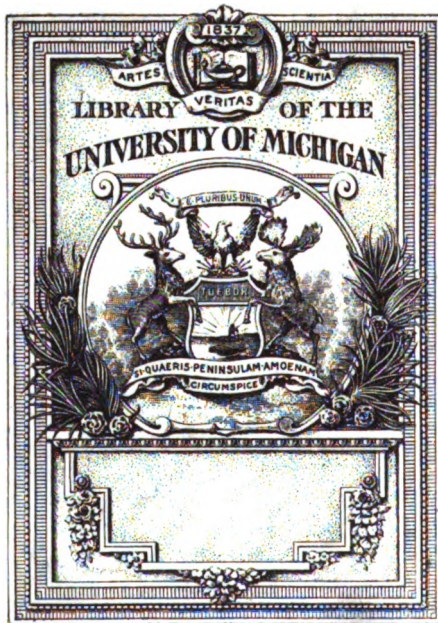
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Archives of otology



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ARCHIVES
OF
OTOLOGY.

EDITED IN ENGLISH AND GERMAN.

BY

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OF NEW YORK

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OF HEIDELBERG

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VOLUME XIII.

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ARCHIVES OF OTOTOLOGY.

ON THE POSITION OF REISSNER'S MEMBRANE
IN THE HUMAN COCHLEA.

BY H. STEINBRÜGGE, IN HEIDELBERG.

Translated by Dr. M. L. KING, New York.

(With two wood-cuts.)

A PECULIAR and not heretofore-described condition of the labyrinth, which I found in a woman thirty-four years of age, who died of tuberculosis, caused a revision of all my old preparations, and the making of new ones, of the human cochlea. The results of the investigation will here only be given in so far as they pertain to Reissner's membrane.

In the anterior lower wall of the left utricle, at the level of the lower margin of the fenestra ovalis, an elliptical perforation was found, the measurements of which were $1 \times 1\frac{1}{2}$ mm.

That this opening was not an artificial one is tolerably certain, as its edges were as smooth and regular as we often find them in perforations of the drum-membrane, and it was seen as soon as the vestibule was opened. In the examination the vestibule was, moreover, opened from the direction of the cochlea by means of thin sections, which were vertical to the long axis of the pyramid. This, then, constituted a communication between the peri- and endo-lymphatic spaces, which probably existed during life. As the patient from whom the preparation was made had died some time previously, in the hospital of a large city, and data as to any aural disease were not to be had, and as the microscopic preparations failed to show the cause of such a circumscribed destruction of the sacculus vestibuli, the opening found

would not have been worth mentioning, if it had not been accompanied by another pathological condition which was also rare.

In the cochlea of the same side, particularly in the second and third turns, there was a considerable deposit of

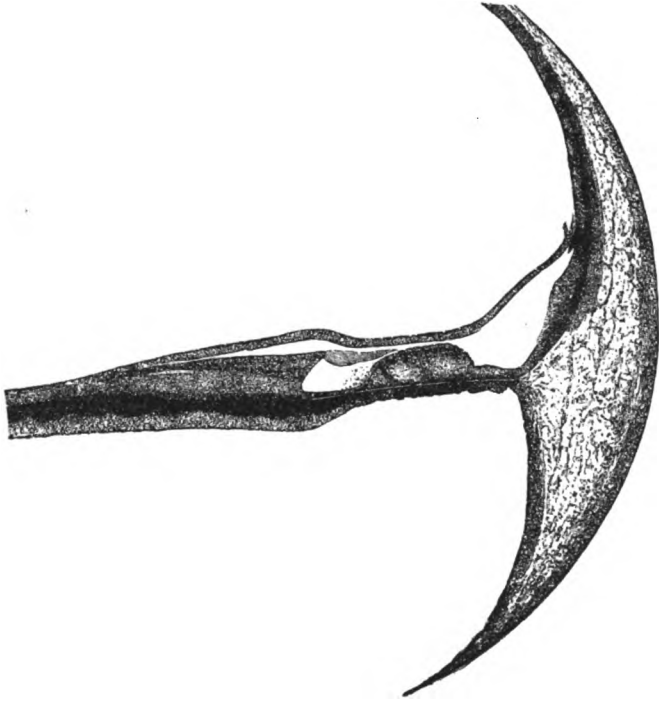


FIG. 1.



FIG. 2.

hæmoglobin, and great dilatation of the vessels, which had ruptured at several places, causing extravasations of blood; besides this, there was a peculiar condition of Reissner's membrane which is shown in the accompanying cuts.

As is plainly seen, Reissner's membrane (vestibular wall, according to Reichert; *membrana vestibularis*, according to Henle) does not pass in a straight line to the outer wall of the ductus cochlearis, formed by the *ligamentum spirale*, but rests on the *membrana tectoria*, covers also Corti's organ, and then gradually passes upward to its point of attachment, so that of the ductus cochlearis only a small space remains. This condition was constant in all the sections, and could also be seen in the cochlea itself by means of a lens.¹

In sections from the beginning of the cochlea only did this vestibular wall appear to pass directly to the outer wall of the cochlea; this conclusion being based on a combination of several fragments, varying in size, of this part. The second cut is intended to show that this membrane becomes agglutinated to the organ of Corti, or, rather, to the *membrana reticularis*.

From this cut we see, that during the process of cutting the sections, the *lamina spiralis membranacea* was torn off; the outer part, with the organ of Corti upon it, being dislocated. Notwithstanding this, the small piece of Reissner's membrane lying on the latter remained attached to it, thus showing how closely the two were connected. Reissner's membrane was also torn.

It was, therefore, very natural to assume this condition to be pathological, and to connect it with the perforation of the utricle. If there had really been a draining off of the endolymph, the collapse of Reissner's membrane is easily explained, provided it was not in a state of tension, but rather in a relaxed condition; and provided, further, that the perilymph passing in through the perforation did not exert a pressure equal to that of the fluid of the same name in the *scala vestibuli* exclusive of the ductus cochlearis.²

It therefore seemed necessary to test the relative pressure exerted by fluids separated by membranes in the same, or, at least, in a similar, manner as are the peri- and endo-

¹ This should be noted, as it proves that the depression seen in the specimens was not made by the section-cutter, as might be supposed.

² Because of the tension and partial fixation of its walls, the utricle had not collapsed, but retained its normal shape.

lymph. For this purpose a piece of the ileum, tied at both ends, and distended with water, was submerged and then incised. Even when this was done at the bottom of a deep vessel, under the pressure of a considerable column of fluid, it was found that after a time the gut collapsed, thus showing that its contents were evacuated, and that the fluid passing in it was not able to counterbalance the pressure on the outside of the gut. One can, moreover, easily convince himself that a piece of intestine, tied at one end, and held open by means of two fingers at the other, and then placed under water, will become only partly filled. To distend this intestine under such conditions, water must be poured into it.

The result of this experiment seems, then, to favor the assumption, that on opening membranous structures containing endolymph, their contents must drain off, and their walls collapse, unless they are able, by means of their ligamentous connection, or their own consistency, to withstand the pressure of the perilymph.

We would seem, therefore, to be justified in assuming that, in the present case, there was a draining off of the endolymph, and that Reissner's membrane sank down on the membrana tectoria and the organ of Corti, in consequence of an excessive pathological stretching or relaxation. It even seemed that this coming in contact had resulted in a growing together of the two structures.

The probability of a pathological change in the vestibular membrane is increased by the fact, that considerable quantities of old pigment were found in parallel sections of this same membrane.

Furthermore, if the sinking down and agglutination of this membrane had taken place during life, the function of the organ of Corti, as well as of the membrana tectoria, must have been thereby impaired.

A re-examination, made for the purpose of comparison, of all the vertical sections of the cochlea at my disposal, showed, however, that the above-described condition of Reissner's membrane is not very rarely found in the cochlea of the human adult. But it is easily overlooked,

especially when this membrane is lying closely upon the organ of Corti, and if it—as happens in most cases—is torn and only fragments of it are found in the section. This same condition of the membrane was also seen in sections prepared from the cochlea of another person who had died of tuberculosis, and it, therefore, seems doubtful whether a relaxation of Reissner's membrane, such as we have described, is to be regarded as pathological.

From the descriptions and cuts in the text-books we certainly are accustomed to picture to ourselves the vestibular membrane and vertical sections of the cochlea, as passing at an angle of about 45° in a perfectly straight line from the crista spiralis to the ligamentum spirale. But it must be remembered that most of these investigations have been made on the cochlea of young animals or embryos; the petrous bone of infants has been but seldom, and in most investigations the cochlea of the human adult has been even less frequently, studied in microscopic sections, as the decalcification of the bone is more difficult and involves the loss of much time; the cochlea of the adult is, moreover, less adapted for the demonstration of normal histology. Even the most expert and careful histologists are seldom successful in preserving Reissner's membrane intact, in vertical sections, because of its fragility; complete drawings of the same, if they are not simple diagrams but have been copied from nature, represent almost exclusively embryonal preparations. We do not possess, so far as I know, an authentic drawing, representing the cochlea of the human adult.

We must not forget, furthermore, that all the preparations used in such investigation, even those of embryos, have been treated with hardening agents, such as osmic acid, chloride of palladium, Müller's fluid, chromic acid, and strong alcohol, in order to make them suitable for cutting. Such treatment must, of course, make it much more difficult to form an opinion as to the actual condition, and the degree of tension, of delicate membranes during life. The

question therefore arises: Is Reissner's membrane during life in the same position in which it is seen in prepared specimens? This is a question of much physiological importance, and is of particular interest in regard to the human cochlea.

The definite solution of this question as regards the human cochlea, is rendered still more difficult by the fact that the petrous bones are almost without exception, removed only several days after the death of the individual, during which time the cochlea undergoes maceration, after which it must be exposed to the action of the reagents and acids above enumerated. It may be possible, however, to form a conjecture as to the shape of the ductus cochlearis during life by comparing a large number of preparations of human cochleæ. We find, for instance, that the membrana vestibularis is sometimes very tense, and again in a condition of total relaxation; and between these two conditions many gradations are found. These variations are seen not only in different cochleæ, but are even observed in the same one, as in the case described, in which the beginning of the first turn was quite different as regards the membrana vestibularis, from parts lying farther toward the apex. Besides this the fragments of the torn Riessner's membrane sometimes assume a curved shape, or even curl themselves up, and the last-named property seems to me to be of particular importance, as indicating a state of elasticity or contractility of this membrane, which is also mentioned by other observers.¹

If the elasticity of this membrane is acknowledged, the conclusion seems permissible, that in the human cochlea, a post-mortem relaxation of the membrana vestibularis,

¹I wish here to call attention to a probably not well-known remark of Reichert, referring to this point, found in his work, "*Beitrag zur feineren Anatomie der Gehörschnecke des Menschen*," etc., on page 12 of *Abhandlungen der Königl. Acad. der Wissenschaften*, Berlin, 1846. It is as follows: "If we also consider that the membranous cochlea is filled with fluid, and that at present it is impossible to obtain this canal, filled with and expanded by its normal contents, for examination, and that the shape of the very elastic vestibular membrane which is fastened to the walls, will probably vary greatly according to the quantity of fluid contained in it, it will be the duty of the anatomist when describing the special outer form of the membranous canal of the cochlea to call attention to the deviations of the shape caused by the condition of the vestibular membrane."

a loss of elasticity, occurs in some instances, while in others it may be wanting, or is present in a less degree ; we may even assume that these variations may occur in different parts of the same cochlea. Now, since in the removal of the temporal bone from the cranium, and the tearing off of the dura mater from the posterior surface of the pyramid surface, the aqueductus vestibuli is always opened, the endolymph can escape, and those parts of Reissner's membrane which have lost their elasticity will then collapse, and cause a narrowing of the ductus cochlearis, as is seen in the two drawings.

It is very natural to connect the loss of elasticity of the membrane with the disease causing death, the more so if the disease has been protracted and of an exhausting nature, and signs of congestion are found in the cochlea. As has already been mentioned, some of the preparations in which Reissner's membrane showed this peculiar condition, were taken from persons who died of tuberculosis. On the other hand, the same condition was found in the cochlea of a woman who died of pleurisy, and in a male suicide, thirty-one years of age, who bled to death from an incised wound in the neck. In the last case especially, it seems improbable that the relaxation of the membrane was due to pathological changes ; it can have been caused only by post-mortem changes.

While further investigations will be necessary for clearing up these intricate conditions, the fact that such changes in Reissner's membrane as have been described may be within the range of the normal state, may, for the present, be a not unwelcome hint to all who are engaged in the investigation of the pathological changes in the human cochlea.

If, moreover, the supposed elasticity of the membrane should be confirmed—and this seems quite probable,—then the form of the ductus cochlearis during life could only be of the triangular, prismatic shape shown in text-books, if the pressure exerted by the endolymph *exactly equalled* that of the perilymph. Under all other conditions Reissner's membrane would be curved and its convex sur-

face be turned to the scala vestibuli or to the ductus cochlearis, according to the preponderance of pressure of the fluids. The first will usually be the case, because the endolymphatic space is shut off, while the perilymph can flow out through the aqueductus cochleæ. It might even be imagined that the elasticity of Reissner's membrane acted, to a certain extent, as a safety-valve, by preventing too great a pressure in the endolymphatic space, be it caused by congestion, increased secretion, or by pressure on the cul-de-sac of the aqueductus vestibuli situated between the layers of the dura mater. The necessity for the exact regulation of the pressure in the ductus cochlearis is at once apparent, if we remember that any increase in it will change the tension of the cord of *the zona pectinata*, and thereby alter its pitch.

Whether an excessive diminution in the pressure of the endolymph can occur, except in the rare cases of perforation of the membranous labyrinth, must remain undetermined for the present.

From what has been said above, the effects of such a decrease of tension can easily be construed.

. SUPPLEMENT (published three months later).

Since publishing the above communication several other observations have been made in regard to the configuration of the ductus cochlearis in man, which seem to support the views there expressed as to the shape of this duct in the living subject.

In regard to the tension of Reissner's membrane much difference was found in various parts of one and the same cochlea, the tension ranging from that of the highest degree to total relaxation.

This fact, and the circumstance that the free edge of pieces of this membrane often appear curved or curled up, I regard as additional support for the assertion made by other authors, that this membrane is elastic during life, and that after death it may or may not lose this property. This elasticity seemed, moreover, to afford to a certain extent protection against excessive variations in pressure in the completely shut-in endolymph.

In the cochlea of a child who died of diphtheria (see paper by Moos, and by the author, in these ARCHIVES, vol. xii., p. 255) there was an unusual coagulation of the endolymph, as well as the perilymph, thus giving to the canals of this cochlea an appearance as if they had been artificially injected. Whether this coagulation occurred during life or during the death-struggle, or whether it was caused by the reagents used in preparing the specimen, could not be determined. Under these circumstances, at all events, a draining off of the endolymph was impossible, and Reissner's membrane was thus fixed in its normal position. The coagulated lymph was so firm that in many of the sections made for microscopic examination, it was preserved entire or in part. Examination of the latter confirmed the opinion expressed above,—that in cases of unequal pressure in the endo- and peri-lymphatic spaces, Reissner's membrane will bulge either toward the scala vestibuli or the ductus cochlearis. In this case, the convexity of the membrane was turned toward the scala vestibuli, thus showing that the pressure in the ductus cochlearis had been greater than that in the perilymphatic space. Even in specimens in which the coagulum and Reissner's membrane were only partially preserved, the former position of the membrane could be recognized by the concave edge of the coagulated lymph remaining in the scala vestibuli.

In the cochlea of another child, who also died of diphtheria, the uncoagulated endolymph had probably escaped, because in this case Reissner's membrane had sunk down in a remarkable degree. It completely covered in all the turns the organ of Corti, the membrana basilaris, and the ligamentum spirale up to their insertion, so that nothing remained of the lumen of the ductus cochlearis, and on a superficial examination the presence of the ventricular membrane might have been readily overlooked.

In regard to this relaxation of the membrane of Reissner, it should be stated, that it was previously observed by Hensen, who described it in the paper: "*Zur Morphologie der Schnecke des Menschen und der Säugethiere.*"¹

¹ *Zeitschrift f. wissenschaftl. Zoologie*, von Siebold und Köl liker. Band xiii.

The paragraph in question, in which the author also gives the size of the angle formed by Reissner's membrane with the crista, is as follows: "It (*i. e.*, Reissner's membrane) passes upward and outward from the crista spiralis, at an angle of 15° in man, and 40° in the sheep, to connect itself with the ligamentum spirale above the stria vascularis. It is strange that, in man, Reissner's membrane diverges so little from the membrana basilaris. The delicacy of the membrane (0.005 mm.) is so great that it could easily be in some relation to the vibrations of sound, but in regard to this I would remark that this membrane *need not necessarily be in a state of great tension*, as, for instance, the distance between its points of origin and attachment measured only 0.825 mm. , while its width was 0.9 mm. I have, moreover, convinced myself by the inspection of fresh specimens *in situ* that the membrane is in a state of relaxation. *Still, it is possible that it is kept tense by the endolymph, which, in all my specimens, had escaped.*"

The supposition, expressed by the above author, in the last sentence quoted, is supported by the condition of Reissner's membrane found in the specimen mentioned above, in which coagulated lymph filled the canals of the cochlea.

Even the statements as to the course of Reissner's membrane, which do not agree with Hensen's description, made by later investigations of the cochlea, may all be reconciled by assuming, that while Reissner's membrane, during life, is elastic and curved more or less by the pressure of the endolymph, IN PREPARATIONS it usually appears quite tense, but sometimes also folded or totally collapsed, in consequence of the loss of elasticity.

As briefly as possible, I will give the views expressed in several prominent works on the cochlea.

As far as I know, Löwenberg and Rosenberg are the only ones who mention an arched position of the membrana vestibularis. Löwenberg opposes the opinion of Kölliker that Reissner's membrane has about the same inclination to neighboring parts in all the turns of the cochlea, and says: "The nearer we approach the base of the cochlea the less acute is the angle formed by the membrana

vestibularis with the basilar membrane, and the less obtuse is the angle which it forms with the stria vascularis." He also says: "In ascending toward the apex of the cochlea it becomes less distinct, becomes more and more rounded, and at the last turn is replaced by a moderately shallow arch. In older embryos this phenomenon becomes more marked, indications of it being found already in the lower turns." These observations were made on preparations of the cochlea of pig embryos about three inches in length. In connection herewith it may be mentioned that Boettcher (*über Entwicklung und Bau des Gehörlabyrinthes*), in fig. 24, A, plate vi., represents the vestibular membrane as slightly curved, while in other plates of the same work it is shown as a more or less straight line. (Fig. 24 was taken from a cat embryo about 9 *cm.* in length.)

Kölliker: "The membrane is tense, and passes in a more or less slanting direction across to the outer wall of the cochlea to become attached to the periosteum."

Middendorp: "The wall of the scala vestibuli, which in its natural condition is in a state of tension," etc. Also: "Hensen's measurements of the inner or central angle of the membranous cochlea are of no value,—because this angle varies according to the height of the membranous cochlea."

Winiwarter: "As is acknowledged by all observers, the angle which it forms with the lamina spiralis, continually decreases as we pass from the beginning to the apex of the cochlea." Also: "I have sometimes, particularly in the upper parts of the cochlea of the guinea-pig, seen Reissner's membrane pass over the whole upper lip of the lamina spiralis, passing across from this point to its attachment under some tension."

Henle: "On section the ductus cochlearis is triangular, bordered by three walls," etc. Also: "The walls diverging from the lamina spiralis are membranous, and in the natural condition are tense, and therefore flat."

Waldeyer: "Internally, Reissner's membrane and the crista spiralis join at a more or less acute angle."

According to Krause a transverse section of the ductus cochlearis is more or less triangular.

From the above extracts we see that the later observers do not mention the relaxation of the membrane as first described by Hensen, although it is apparently not so

rarely found in specimens of the human cochlea. Winiwarter alone seems to have made a few such observations. The peculiar, arched shape of Reissner's membrane, described by Löwenberg, may have been caused by his method of preparation, which consisted in putting the cochlea into a solution of gum arabic, which was allowed to coagulate or set. We may assume this to be the cause if we do not wish to acknowledge that the form and consistency of the membrane in the embryonal condition differs from the later stage of development, as would appear to be the case from Boettcher's plates.

From what has been said above, we can easily see that the angle formed by Reissner's membrane in the pathological or histological specimen, is in no definite relation to the curved shape it probably has in life.

BOROGLYCERIDE

IN THE TREATMENT OF PURULENT DISEASES OF THE EAR.

By RICHARD C. BRANDEIS, M.D., NEW YORK.

IN the treatment of purulent diseases of the external and middle ear, whether acute or chronic, the leading indications are, the thorough removal of the secretions which may have accumulated, and the restoration of the affected surfaces to a healthy condition. As suggested by Bezold¹ these desiderata will be most certainly arrived at by the application of the general principles of antiseptics in the treatment of diseases of the ear.

In the article referred to, Bezold strongly advocated the use of boracic acid, which, as he found, answered the purpose of antiseptics more satisfactorily than either carbolic acid, salicylic acid, or thymol. As is generally known, this remedy is to be applied to the diseased parts in the form of a saturated solution or, still better, the meatus and—in case there be a defect in the membrane—the tympanic cavity are to be filled with the finely triturated powder in substance.

In his *Ephemeris*² Squibb says of boracic acid: "It is a very potent antiseptic, probably equal to salicylic acid, * * * and its advantages over carbolic acid, for some purposes, are chiefly that it is odorless and more easily managed." On the other hand, Professor Barff³ says: "I have lately seen it asserted that boracic acid *alone* has not the power of preventing decomposition, but only

¹ Zur antiseptischen Behandlung der Mittelohreiterungen: *Arch. f. Ohrenh.*, Band xv., Heft 1.

² May, 1883, No. 9, page 302.

³ *Journal of the Society of Arts*, London, 1882.

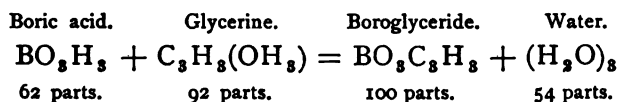
in combination with other substances, and my experience entirely confirms this statement."

In spite of these conflicting views, and influenced by Bezold's urgent advocacy, I proceeded to give boracic acid an extended trial in the treatment of purulent diseases of the ear, limiting my cases to those met with in private practice, in order to be able to watch the results more carefully. I was the more willing to do this, as I had become convinced that the use of the common astringent, solutions of alum, silver, zinc, and potassium permanganate, was not always satisfactory nor unattended with serious evils.

I have, however, found in many cases, that the most careful syringing, and the thorough removal of the morbid secretions, followed by the instillation of the four-per-cent. solution of boracic acid, did not suffice to mask the offensive odors arising from the ear. Discarding the solution, I began to pack the meatus with the finely powdered acid. This did, it is true, lessen the odor, and also diminished the quantity of pus discharged; but I am inclined to believe that the latter was due, not so much to the improved condition of the organ, as to the greater difficulty which the secreted fluid found in making its exit through the thick and dense layer of the powdered acid. In some cases the retardation of the flow of pus was as great as in the use of alum, tannin, and other astringent powders. I observed an occasional tendency of the powder "to cake," which rendered its thorough removal difficult, owing to its firm adherence to the walls and depressions of the cavity. This was the more apt to occur, when some of the powder had passed through the perforation of the membrane into the cavity of the tympanum. In these cases the quantity of water required to dissolve and thoroughly remove the mass was so great, that the secreting surfaces became sufficiently macerated to stimulate the discharges to a degree which rendered all that had been previously achieved, useless. In consequence of this, I became more careful in my use of the powder, and, like many aurists, have almost entirely discarded the syringe,

which is now only used when the secretions have become so dessicated that they must be softened before they can be removed. In the place of the syringe I make use of absorbent cotton, which is attached to small, flexible probes. By this means I am able to absorb all the fluids contained in the meatus and, if the membrana tympani is perforated, I clear the tympanum by means of the air douche or the Eustachian catheter before applying the absorbent cotton. After this is done, a small quantity of finely powdered iodoform and oxide of zinc, in equal parts, is carefully blown into the meatus, so as to form a thin coating over the entire affected surface. This remedy has proved quite satisfactory in my hands, inasmuch as it was readily absorbed and appeared to diminish the quantity and improve the quality of the purulent secretion. Owing, however, to the disgusting and penetrating odor of the iodoform, which neither the attar of roses nor the extract of the vanilla bean is able to disguise, I have time and again had patients so rebel against its continued use that I have been compelled, reluctantly, to refrain from its further application.

In March, 1882, Professor Barff¹ read a paper before the London Society of Arts on "A new antiseptic compound, and its application to the preservation of food," etc. In this address the author showed that boracic acid and glycerine, when heated, combined to form a new substance, *i. e.*, boracic glycerine or boroglyceride. According to Barff the proportion is that of their atomic weights,—thus :



The sixty-two parts of boric acid and the ninety-two parts of glycerine are gently heated over a water bath, the boric acid having been gradually added to the glycerine, until the fifty-four parts of water have been driven off, leaving the one hundred parts of boroglyceride. This, on cooling, is an amber-colored, vitreous mass, which is very

¹ *Loc. citat.*

friable and easily broken. It is readily soluble in glycerine, but less so in cold or hot water (about ten per cent.).

Boroglyceride has an acrid, pungent taste, and has an astringent effect when applied to mucous membranes.

Shortly after the publication of Professor Barff's paper, Mr. Balmanno Squire¹ suggested that the new compound be given a trial in antiseptic surgery. This led me to prepare a quantity of the boroglyceride, which I have since then used freely.

I am in the habit of using the boroglyceride in solutions, ranging in strength from ten to fifty and more per cent., generally beginning with the more concentrated solutions, and diminishing their strength as the mucous membrane assumes a healthier condition, and as the discharges diminish. My method of application is thoroughly to clean the diseased surfaces by first driving as much as possible of the secretions out of the tympanic cavity with the air douche or Eustachian catheter; then, by absorbing the fluids with pledgets of borated cotton until all that can be seen is removed. Bending the head of the patient to the unaffected side, or, if both ears be diseased, to the side opposite to the one under treatment, I instil a few drops of the boroglyceride into the meatus, filling it about half. In case there be a perforation of the membrana tympani, I introduce, according to the plan of Politzer, a catheter into the mouth of the Eustachian tube and inflate it thoroughly, so that the air may pass through the column of fluid contained in the meatus. By this means the boroglyceride, be it ever so viscid, is able to pass through the perforation into the tympanic cavity, thereby coming in contact with and exerting its beneficial influence upon the entire secreting surface. I generally make these applications two or three times a week, varying with the intensity and urgency of the case, and at the same time the patient is provided with a quantity of the medicament, and instructed to cleanse the ear as thoroughly as possible morning and evening; then to instil a few drops into the meatus, and plug the ear with cot-

¹ *British Med. Journ.*, April 29, 1882, p. 644.

ton soaked in vaseline, to prevent as much as possible the escape of the boroglyceride.

This remedy has enabled me to discharge patients as cured in from three to four weeks, who, I am sure, under the old methods, would have been under treatment for as many months.

After a few applications have been made, a decided improvement in the condition of the mucous membrane is observable. The congestion is less, the thickening diminished, and the appearance similar to that found in the mucous membrane of the conjunctiva after the application of nitrate of silver. The fetor arising from the retained pus begins to disappear almost immediately, and this in itself is sufficient to recommend the use of the boroglyceride. By repeated applications the quantity of the secretion diminishes steadily, and soon ceases altogether.

When polypoid excrescences or exuberant granulation-tissue are formed in the lower part of the meatus, or in the cavity of the tympanum, I have been in the habit of using a fifty-per-cent. solution of boroglyceride with an equal quantity of eighty-five-per-cent. alcohol. To this mixture the hyperplasia quickly yields; but I am inclined to attribute the beneficial effect more to the hygroscopic action of the rectified spirit and glycerine than to the therapeutic effect of the boric acid.

In three cases of perforation of the membrana tympani after chronic otorrhœa I have employed boroglyceride as an artificial drum-head. These were all cases in which the use of Yearsley's cotton pellet, recently so highly recommended by C. H. Burnett and H. Knapp, could not be persevered in, owing to the irritation and renewed discharge which its continued use gave rise to.

Here I employed a seventy-five-per-cent. solution of boroglyceride (*i. e.*, seventy-five parts of boroglyceride and twenty-five parts of glycerine), a few drops of which were instilled into the meatus and, owing to its viscosity, became adherent to the remaining membrane. In order to keep this in position, the mass of fluid was coated with a thin layer of collodion. Thus I succeeded in improving the hearing of

each patient considerably. The good effect of this artificial drum-head continued during periods varying from three to eight or ten days, when the same procedure had to be repeated.

In acute affections the application of boroglyceride is attended with some pain, but I have been able to control this by adding either the tincture of aconite or a one-half-per-cent. solution of atropia.

The following cases may serve to illustrate the foregoing remarks.

CASE 1.—Edward Sch., aged thirty-one years, while bathing in the Atlantic, at Long Branch, during the summer of 1881, was struck, on the left side of the head, by a heavy breaker. The blow was so violent, that he lost his foothold and disappeared under the waves. As soon as possible he retired to his bathing-house, and found that he was quite deaf in the left ear. As the hearing did not return and some pain was felt, he, a few days after the accident, consulted his physician, who ordered leeches to be applied to the mastoid process, and sedative drops to be instilled into the meatus. These measures appeared to relieve the pain, but did not improve the hearing. As Mr. S. was led to believe that the lapse of time would bring about a restoration of the affected organ, he sought no further advice at the time.

In June, 1882, ten months after the accident, Mr. S. consulted me for the relief of deafness, dizziness, and unsteadiness of gait. He complained most, however, of an exceedingly disagreeable sensation, as of a current of cold air passing through and out of his ear at every expiration. This annoyed him to such a degree as to seriously disturb his mental equipoise.

There had never been any discharge from the ear, excepting for a few days after the injury was received.

On examination, a somewhat opaque and slightly retracted drum-head was found, which showed a large semilunar rupture, extending from the superior anterior quadrant, downward and backward to the inferior posterior quadrant, and to the periphery of the membrane. The edges of the rupture were well retracted and somewhat thickened, showing it to have been of long standing. The handle of the malleus was drawn upward and back-

ward, and the cone of light had disappeared. On testing the hearing, it was found: $hL = \frac{2}{8}$, $VL = \frac{2}{8}$. In the right ear hearing was normal. The pharynx was studded with enlarged follicles, which secreted a large quantity of tenacious mucus.

Although I was not inclined to give a favorable prognosis, Mr. S. begged me to institute a line of treatment which might afford some relief for the dizziness and the stumbling gait, and to free him from the troublesome effects of the current of air which passed through his ear. I carefully introduced a small pellet of borated cotton into the meatus, and gently pushed it down to the drum-head, so as to cover the entire perforation. I also ordered large doses of quinine, in the hope that they might relieve the vertigo, and requested the patient to return in a few days. I saw him again after the lapse of forty-eight hours, because of ear-ache, and a purulent discharge, which had set in during the night after the first visit. I removed the cotton pellet, and found the membrana tympani much inflamed and the lips of the perforation bathed in pus. The ear was thoroughly cleansed by the dry method, and a few drops of a fifty-per-cent. solution of boroglyceride were instilled. This was to be repeated every four hours, and the patient was ordered to return in two or three days. He did not come again for more than a week, when it was found that the discharge had entirely ceased, and the size of the perforation was considerably lessened. I learned from the patient, that for several hours after the use of the drops the rush of air was hardly noticeable, but after this again became annoying. Half a drachm of quinine had been taken daily for nearly two weeks, and served to improve the patient's general condition, and had also relieved the dizziness and the impaired co-ordination.

I now applied five or six drops of a seventy-five-per-cent. solution of boroglyceride by means of a small pipette. These were introduced, through the perforation, into the cavity of the tympanum. The entire drum-head was smeared over with a thin coating of collodion and the meatus loosely packed with cotton. This application afforded marked relief, checking the passage of air entirely for four or five days, when the layer of collodion became detached and the old trouble reappeared. I repeated the above applications, at intervals of a week, for several months, and for some time observed a gradual diminution in the size of the perforation. But as this did not seem to continue I did not feel justified in pro-

longing the treatment, and in Sept., 1882, I gave the patient a quantity of the boroglyceride with instructions to apply it every night. This he did for six months, and in March, 1883, he again visited me. At that time I learned that he had not suffered at all from dizziness and unsteadiness of gait since I last saw him; the use of the boroglyceride had succeeded in lessening the intensity of the current of air, but had to be applied without intermission. On inspection, the rupture was found to be only about one third its original size.

The patient has since removed from the city, and on inquiring, I learned a few weeks ago, by letter: "I have so far recovered that I do not think I need subject myself to any further treatment."

CASE 2.—Willie T., aged eighteen years, was first examined Sept. 17, 1883. He stated, that five years before, he had suffered from an attack of malignant scarlet-fever, in the course of which his ears and throat were seriously affected. Since then hearing has been greatly impaired, and there has been an almost uninterrupted flow of pus from both ears. During the intermissions the deafness always became more marked, and earache invariably supervened.

On examination, I found the meatus on both sides almost filled with offensive pus. $R = \frac{4}{8}$; $L = \frac{7}{8}$; $VR = \frac{8}{8}$; $VL = \frac{1}{8}$. After removing the secretions, hearing was noticeably better, viz: $R = \frac{3}{8}$; $L = \frac{1}{4}$; $VR = \frac{1}{8}$; $VL = \frac{1}{8}$. Inspection now showed large perforations of both *Mtt*, with polypoid excrescences cropping out through the perforated left drum-head. These granulations were found to arise in the tympanic cavity, and were removed by means of Blake's snare. When the hemorrhage had ceased both meatuses were thoroughly cleansed and lightly packed with a powder composed of equal parts of finely triturated boracic acid, iodoform, and oxide of zinc. The patient was told to syringe both ears, night and morning, and then to insufflate the powder just mentioned. He was to return in four or five days for further treatment.

On the third day Mr. T. again called, saying, that since the first insufflation of the powder the discharge had entirely ceased, but the pain in the ears and throat was so intense, that he was unable to attend to his school duties or get any sleep. On examination, I found some of the powder firmly impacted in the lower portion of the auditory canals, although repeated injections had been

made in order to remove it. The mass was so thoroughly caked that I had to remove it by means of forceps, a prolonged current of warm water not sufficing to break it down. I had so often met with this complication, as noted above, that I determined to omit the further use of the syringe and the powders in this case. The ears were thoroughly cleansed by means of absorbent cotton, and a few drops of the fifty-per-cent. solution of the boroglyceride instilled as deeply as they would go. This was well borne, the pain disappearing in the course of a few hours. This remedy was applied, by the patient's friends, morning and evening. A week later, I found the condition of the mucous membrane in both ears much improved, the discharge having steadily diminished. In November, 1883, both perforations had become so much smaller that I discharged the patient from further treatment, with the instruction to return as soon as a relapse set in. Since that time I have not again seen Mr. T., and I may, therefore, conclude that he is practically cured.

A CASE OF PRIMARY PERIOSTITIS OF THE MASTOID.

By Dr. CORNELIUS WILLIAMS, OF ST. PAUL, MINN.,

FORMERLY ASSISTANT SURGEON AT THE N. Y. OPHTHALMIC AND AURAL INSTITUTE, ETC.

On May 11, 1883, Charlotte Mead, aged eleven years, was sent to me by Dr. James Davenport. She had had an occasional earache for several years, but there had been no discharge from the ear at any time, nor had there been any serious impairment of hearing. The patient states, that it has been her habit when suffering from earache to stuff the ear with cotton, and that often, when coughing violently, the cotton pellet would be forced out and for some distance upon the floor, indicating an unusual patency of the Eust. tube on that side. The girl is tall for her age, of somewhat scrofulous appearance, blonde, and, in general, has pretty good health. The right auricle is seen to stand out from the head at almost a right angle, and behind, and chiefly over the superior portion of the mastoid region there is a well-marked swelling with redness and œdema, which pits on pressure, and the elevation is about equal in size to a pullet's egg. The auricle is also reddened and swollen. The external auditory canal is normal. The membrana tympani is entire without cicatrix, and is slightly reddened. Hd. 10 inches for the watch; it is less on the left side, and there is evidently chronic aural catarrh. The patient states that there has been great pain for three nights, so much as to deprive her of sleep. Pressure over the swollen part is not extremely painful now, and there is also some tenderness on pressure upon the temple, just in front of the ear. There is no swelling, pain, or stiffness in the sterno-cleido-mastoid, or the nape of the neck; the pain all tends anteriorly.

An ice-bag was ordered to be constantly applied over the swelling. May 12th, the pain is much less, and the swelling has diminished markedly. She says she has not slept so well for a week as last night. The redness of the *Mt* is almost entirely gone. She does not hear so well as yesterday. On May 16th, I found that the swelling had entirely disappeared, the *Mt* is no longer red, and she hears the watch at 20", which is as she heard before the onset of the disease.

This would seem to have been a case of acute primary inflammation of the periosteum of the mastoid, differing from most of the cases which have been reported, in that the periostitis *was* primary and unattended by other apparent complications.

The efficacy of the ice treatment, as recommended by Politzer, which has served me well in other forms of mastoid disease, is here very well shown.

A CASE OF CHRONIC PURULENT INFLAMMATION OF THE MIDDLE EAR, COMPLICATED BY FACIAL PARALYSIS, NAUSEA, VOMITING, UNSTEADINESS IN THE GAIT, AND MARKED DEAFNESS.

By GORHAM BACON, M.D.,

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Frank Cottman, farmer, æt. twenty-four, consulted me Oct. 16, 1883, on account of a discharge from both ears; had scarlet-fever and measles fifteen years ago but no ear-trouble at that time; is subject to frequent colds in the head and has "catarrh." About five years ago he first commenced to have earaches, which were repeated after every exposure to cold, and each time pain was attended with discharge. About three years ago, a doctor in Reading, Penn., he says, removed "tumors" from both ears, and told him, eighteen months ago, that the ears were entirely cured. For the past year he has gradually been growing deaf, and for the same time the ears have been discharging slightly. Three weeks ago the discharge began to be very profuse. About a week before I saw him the discharge from right ear became very offensive and increased in quantity. At the same time patient had an attack of nausea, vomiting, and vertigo which continued for three days, and which was brought on by a cold. Every time that he attempted to walk all objects seemed to turn round in a horizontal plane from left to right; he had tinnitus for some time in both ears, but it was not increased during this attack.

H. D. for the watch $\frac{9}{16}$ for both ears. Tuning-fork placed on the forehead, heard about the same in each ear. Patient only hears when I stand close to him and shout. He has hypertrophic nasal catarrh with septum nasi deviating to left side; catheter on

this side introduced with difficulty. Left auditory canal narrowed and filled with granulations; right auditory canal also contains granulations, and *Mt* seemed to be perforated and partially adherent to inner wall of tympanum. By Politzer's inflation air passes through both ears; more freely through right one. Patient given calcium sulphide. Granulations touched with chromic acid (sat. sol.); canals dried with absorbent cotton and pulv. acid. boracic. insufflated.

Nov. 2d. Same treatment has been continued ever since; discharge less; hears loud voice now. He has been unsteady in his gait several times when turning round suddenly. H. D., R, $\frac{1}{8}$, L, $\frac{1}{8}$. Plug of absorbent cotton inserted to-day in left meatus, to dilate canal.

Nov. 8th. Feels very much better; hearing for the voice improved; has not been subject to vertigo or unsteadiness in gait since last visit. Eustachian catheter has been used during the past week; as air has not passed readily through tubes by Politzer inflation.

Nov. 9th. Hearing has been much improved until last night about midnight when he had severe pain in the left ear; also at angle of jaw and shooting up over side of face and temporal region. This morning he noticed that his face was drawn to one side; cannot whistle or close left eye; food accumulates between cheek and gums, and saliva dribbles down on affected side; soft palate and tongue deflected to right. Facial paralysis well marked on left side; ptosis slight. H. D., R, $\frac{1}{8}$, L, $\frac{1}{8}$. Tuning-fork on vertex heard better in right ear; discharge profuse and very disagreeable from left ear. Inner end of left audit. canal swollen and inflamed; catheter used. Acid. boracic. et hydrastis insufflated. For several days he has been using alcohol instilled into right ear.

Nov. 10th. H. D., R, $\frac{1}{8}$, L, $\frac{1}{8}$; has had some pain at angle of jaw; small polypus removed from left ear. Ophthalmoscopic examination made but nothing abnormal found.

Nov. 13th. Polypus removed from right ear, protruding through perforation close to short process of malleus; granulation removed from left ear. While syringing left ear to-day, incus, almost entire, and carious on inner surface, came away; discharge very offensive; caries of mastoid antrum undoubtedly exists; no pain over mastoid process.

Nov. 14th. A great deal of cheesy matter syringed out from

left ear ; granulation from upper portion of bony canal (left) removed with Sexton's snare. Paralysis about the same ; catheter used ; iodoform insufflated.

Nov. 16th. Patient feels much better ; facial paralysis less marked, deglutition not as affected as it was ; discharge from left ear less offensive ; upper portion of left bony canal carious ; iodoform used as before, and plug of cotton inserted to dilate canal as before.

Nov. 22d. Iodoform has been used every day, also Eustachian catheter. No dizziness for some time. Electricity begun to-day ; muscles respond but slightly, if at all. Taste slightly affected on left side of tongue. Strychnia, $\frac{1}{4}$, gr. given three times daily.

Nov. 28th. Granulation removed from upper portion of left bony canal, and small, remaining part of incus came away.

Dec. 5th. H. D., L., $h. \frac{1}{16}$, R, $h. \frac{1}{16}$. Acoumeter, L, 1', R, 12'. Tuning-fork on vertex heard a little louder in right ear. Patient hears the voice now when slightly raised ; is much improved in general health ; appetite good.

Dec. 10th. Left auditory canal is now well dilated. *Mt* entirely destroyed, discharge slight and not offensive ; upper portion of bony canal carious. Right *Mt* partially destroyed posteriorly, and adherent to inner wall of tympanum. Several small granulations on inner wall of tympanum. For several days pulv. acid. boracic. et calendulæ has been used with benefit. Some discharge from this ear. In testing the hearing with the tuning-fork, bone-conduction is better for both ears than aërial conduction. There is a well-marked difference for the left ear, while it is but slight for the right. Patient is able to whistle now, and there is some improvement in the paralysis.

This case seems to me to be of considerable interest for the following reasons : A week before I saw the patient, the symptoms were of a serious nature, indicating probable implication of the semicircular canals, as shown by the attack of vomiting, vertigo, and unsteadiness in the gait. After both auditory canals were dilated, the polypi and granulations removed, so that the purulent discharge had a free exit, there was a marked improvement in the patient's general health, appetite, etc., a decided change for the better in the patient's hearing, and a disappearance of the vertigo and unsteadiness in gait. The occurrence of facial

paralysis is also very interesting, as the nerve is rarely affected in cases of otitis med. pur. chron. Roosa, in his "Treatise on the Ear," in speaking of the occurrence of facial paralysis in the course of chronic suppuration of the middle ear, says: "In the greater number of cases in which it occurs, it is permanent, from the fact that the nerve tissue is destroyed by the ulcerative process; but I have seen cases of temporary paralysis of the seventh, which were probably due to pressure upon the nerve trunk; for, where the suppuration of the ear was checked, the functions of the nerve were restored and the face resumed its normal appearance." Politzer believes that slight facial paralysis more often occurs during the course of middle-ear disease than is generally supposed, but that it escapes observation. Wilde and Von Troeltsch have shown that facial paralysis is developed at times when middle-ear disease occurs without perforation. Necrosis of the Fallopian canal may occur, however, and the nerve be bathed in pus, and there is no paralysis until the nerve itself is inflamed. Different branches of the facial nerve may be more affected than others; sometimes the paralysis is more developed in the muscles about the eye, sometimes those about the nose or mouth. When the soft palate is paralyzed, it is probable that the inflammation attacks the facial nerve at the gangliar intumescencia, or between it and the brain, as the levator palati and azygos uvulæ muscles are supplied by the Vidian nerve, which joins the facial at this ganglion, through the large petrosal nerve. This assumption of facts is by no means certain. The prognosis as to ultimate recovery from the facial paralysis in the case which I have recorded, is unfavorable, as there exists considerable necrosis of the upper wall of bony canal, and probably of the mastoid antrum.

TWO FATAL CASES OF CARIES OF THE TEMPORAL BONE; OPENINGS MADE THROUGH ROOF OF TYMPANUM; AUTOPSIES.

By T. Y. SUTPHEN, M.D., NEWARK, N. J.

CASE 1.—*Sept.* 25, '83. Was called to see Alfred B., æt. forty-four, wire-weaver. The day previous he travelled a long distance in the cars, and walked home from the depot, several squares. For twelve years he had suffered from otorrhœa. Pain began a few days before. No further history could be obtained.

I found him persistently lying upon the right side, breathing stertorously, and perspiring; face flushed, and pupils contracted. When aroused, and asked regarding pain, could not speak,—showing complete aphasia,—but, muttering, passed his hand across the forehead and left side of head. Right ear contained a little cheesy pus, which, when removed, exposed a large perforation of the membrane. Left external canal partly filled with thick, offensive matter, and partly occluded by the swollen posterior and upper walls, which, when touched, caused the patient to shrink. No tenderness nor swelling over either mastoid. Ophthalmoscopic examination unsatisfactory, but sufficient to show swollen retinal veins. Temperature not taken; pulse 80. Ordered fomentations, and sent patient to St. Michael's Hospital.

Sept. 26th. Symptoms much the same as day before, but coma increased, seventh nerve, left side, paralyzed, and pupils still contracted. Ophthalmoscope showed choked disc in both eyes. Right ear dry; left filled with secretion. Made a long incision through the swollen tissue in left external canal, giving exit to a little thick pus, and revealing extensive caries of the posterior and upper walls of this passage and the middle ear—the probe passing well back into the mastoid. Immediately following this operation, complete paralysis of the right arm and leg was

noticed. Members of the hospital staff present, concurred in the opinion, that there was an accumulation of fluid in the immediate vicinity of the diseased bone, and that to liberate this was the only means of prolonging the patient's life. A thorough search was made for sequestra or sinuses, but none found.

Concluding that no benefit would arise from further opening the mastoid, it was thought best to perforate the roof of the carious cavity, which was done by drilling with an ordinary trocar, depressing the handle as much as possible, and directing the instrument nearly upward. A probe was then passed, with care, well into the cranial cavity, and withdrawn, but no fluid escaped. This was repeated with a like result. Supposing, then, that the abscess, if it did exist, was beyond reach, the case was considered hopeless, and further efforts at relief abandoned.

Sept. 27th. Twenty-four hours after the operation patient in profound coma and dying; pupils widely dilated, and left external canal filled with a brown, offensive, watery discharge entirely different from that previously found. Death two hours later.

The AUTOPSY showed an immense abscess, occupying nearly the whole of the anterior and middle lobes of the left hemisphere of the brain, containing a dirty-brown, extremely fetid collection of pus, resembling that found in the external canal; the walls were formed by a thin layer of greenish, softened brain-substance. The opening made by the operation entered the cranial cavity on the superior surface of the petrous bone, just in front of the superior petrosal sinus, and at a point corresponding to the eminence for the superior semicircular canal. In the depression just external to this, a circle of dead bone, one fourth inch in diameter, appeared. To this the dura mater was attached and perforated by a small circular ulcer. There was some localized meningitis. The parts behind the tentorium were natural, and the large ganglia at the base escaped being involved.

The instrument used at the time of operating, had pierced the dura mater and entered the abscess cavity, but the flow of pus was probably prevented by either the soft brain-substance or the dura mater itself acting as a valve, which might have been obviated, had the opening been en-

larged. The pus must have exercised considerable pressure, as a jet was thrown out several feet when the meninges were punctured. Further examination of the temporal bone was prevented by the haste of the family in removing the body.

The case seems to be instructive, in that it shows that an abscess in this locality can be quite readily and safely reached, when chances of relief by trephining the mastoid are wanting, and if done early enough, might prolong, if not save, life, by removing the pressure within the cranial cavity. In this case a favorable result could not have been obtained, even with a free opening, the changes in the brain-substance being great, but, no doubt, an early operation might have been beneficial.

CASE 2.—Rudolph Z., æt. twenty-one, admitted to St. Michael's Hospital Nov. 16, 1883, stated that, ten years ago, while ill with measles, his right ear first became affected. An almost continuous discharge had existed since. Two weeks previous to admission the amount of secretion greatly increased, and he began to have severe pain in that ear, spreading over the right side of his head and forehead, which became more intense each day.

Nov. 17th. He was unable to leave his bed; his countenance indicated suffering; the skin was bathed in perspiration; the right external auditory canal was partly filled with muco-pus, and partly occluded by swelling of its walls, which prevented a view of the middle ear. There was no tenderness, œdema, nor swelling about the mastoid, and no sensitive spot was found by percussing that side of the cranium. Inflation by Politzer's method ineffectual and painful. There was complete paralysis of the right abducens muscle, and the sight was impaired in each eye. The ophthalmoscope disclosed swelling of the disc and distention of retinal veins in both eyes. The patient had a short, severe chill in the morning, followed by a rise in temperature and profuse sweating. T., A.M., $104\frac{1}{4}^{\circ}$; P.M., $100\frac{3}{4}^{\circ}$; pulse, 100. Warm water and steam was ordered for the ear, and bromides internally.

Nov. 18th. The discharge was less, as was also the swelling in the external canal; the cavity of the tympanum, which could be seen, presenting a granulating surface. Sight was greatly impaired, and the patient had two chills, morning and evening. T., A.M., $100\frac{1}{4}^{\circ}$; P.M., 101° ; pulse, 87.

Nov. 19th. Again two chills and profuse sweating, paroxysmal pain, total loss of vision, and inclination to lie upon the right side. Peculiar muscular twitchings were noticed about the limbs. T., A.M., $100\frac{1}{2}^{\circ}$; P.M., $102\frac{3}{4}^{\circ}$; pulse, 100. Quinine administered.

Nov. 20th. One chill. T., A.M., 102° ; P.M., $102\frac{1}{2}^{\circ}$; pulse, 100.

Nov. 21st. No chill, less pain, slept without medicine, and seemed decidedly brighter. Scarcely any discharge from the ear, and the patient had slight perception of light. T., A.M., 104° ; P.M., 102° ; pulse, 100.

Nov. 22d. Condition about the same, but the sight rapidly improving. T., A.M., 103° ; P.M., $102\frac{3}{4}^{\circ}$; midnight, 104° ; pulse nearly 110.

Nov. 23d. He was drowsy, but started frequently with severe pain; the discharge from the ear had increased; the ophthalmoscopic appearance was unchanged, but sight was sufficient to count fingers at twelve feet with each eye. There was a general typhoid appearance about the case; his lips and tongue were dry and parched, sordes on the teeth, and tenderness in the right iliac fossa, but no spots characteristic of typhoid fever, and the skin instead of being dry was moist. T., A.M., 105° ; P.M., $102\frac{3}{4}^{\circ}$; midnight, 104° ; pulse, 100.

Nov. 24th. Mild delirium. T., A.M., 102° ; P.M., 103° ; pulse, about 120.

Nov. 25th. Patient showed exhaustion, and was semi-comatose, but could be aroused, and answered rationally; the pupils were normal, and there was no further paralysis. T., A.M., 104° ; P.M., 103° ; pulse, 130.

Nov. 26th. Coma. T., 104° ; pulse, 140. An incision was made through the swollen tissue in the external canal, upward. A bent probe inserted through this cut passed over bare bone, and at two thirds the depth of the canal slipped into a carious passage, and with very slight resistance entered the cranial cavity. Although the symptoms did not point to the presence of imprisoned pus, it was thought better to enlarge this bony sinus, which was done with a trocar, and the probe re-inserted—but no pus escaped. Patient remained comatose until midnight, when he died.

At the AUTOPSY the right lateral and superior longitudinal sinuses were found occupied by a large, and partially organized clot, breaking down in various places; the walls of

the sulcus, for the lateral sinus, were discolored, showing carious changes; circumscribed meningitis existed contiguous to the temporal bone, and there was incipient softening on the surface of the middle lobe. The opening into the cranial cavity was found in the depression just external to the eminence for the superior semicircular canal, surrounded by carious bone which easily crumbled under pressure, the probe having passed into the substance of the brain. There was very slight hemorrhage in the track of the instrument. No accumulation of pus was found. The temporal bone, which was removed, was extensively carious, involving the walls of the middle ear and the mastoid portion. No examination was made of the other parts of the body.

In reviewing these two cases, both resulting from caries of the temporal bone, subsequent to chronic middle-ear disease, the contrast in the chief symptoms is striking.

With the cerebral abscess we had lessening of the discharge, marked changes in the size of the pupil, choked disc, extensive paralysis, early coma, and a rapidly fatal result.

With the thrombosis, increased secretion, normal pupil, swollen disc, slight paralysis, and tardy termination. In neither was there nausea or vomiting, and there was an entire absence of swelling or œdema about the mastoid. The other symptoms in case 2 were what we might expect in blood-poisoning—but interesting features were the changes in the patient's vision, and cessation of the chills on administration of quinine.

I should state that the heart-beats, as recorded, were approximate, and generally taken in the morning.

CLINICAL NOTES OF CASES OF DISEASE OF THE NERVOUS APPARATUS OF THE EAR.

By CHARLES J. KIPP.

AS the following cases present some features not often seen in connection with Ménière's train of symptoms, I place them on record.

CASE I.—*Ménière's train of symptoms preceded by a febrile paroxysm and followed by neuralgia and an erysipelatoid inflammation of the face. Partial recovery of hearing.*

H. H., a small, spare man, forty-eight years of age, consulted me for the first time on the 28th of November, 1882. The previous history of the case is as follows : *He has been totally deaf in his right ear since infancy.* This ear has never given him any pain, and it has at no time discharged matter. *The hearing of the left ear was, until the present sickness, so acute that his associates were not aware that he was deaf in one ear.* He has never had pain in this ear. He has at no time been sick enough to require the services of a physician, and there is no suspicion that he has had syphilis.

On the 12th of October, 1882, in the evening, he had a severe chill, which was followed by fever and sweating. On the following days he felt very tired and suffered much from headache, especially in the left frontal region. These symptoms had, however, almost passed away, without treatment, by October 19th, a week after the chill. On the evening of that day while on his way home from his work he felt very dizzy, and his left ear felt as if it was stuffed full of cotton-wool. At the same time he felt great roaring in this ear. Later in the evening the roaring increased in loudness and at bedtime he was so deaf that he could not hear his wife's voice. Being very tired he slept some, and on awaking

next morning he found to his great joy that his hearing was in a great measure restored. The roaring had ceased, but he heard now a loud hissing noise. While in bed he was free from dizziness, but on rising it returned. The tinnitus and vertigo continued for some days and then gradually passed away. His hearing had, in the meanwhile, become almost as acute as it was before this attack.

During the next two weeks he felt entirely well, but on the morning of the 12th of November, twenty-four days after the first attack of deafness, he had another severe attack of vertigo and roaring in the ear, which was speedily followed by complete deafness. The deafness continued for about twenty-four hours, and then gradually passed away. The tinnitus and vertigo continued longer than in the first attack, and he therefore consulted his family physician, with regard to these symptoms, who gave him a cathartic, which relieved him somewhat but not entirely.

A marked increase in the vertigo and tinnitus was noticed on the 24th of November, for which his physician now gave him moderate doses of quinine. This remedy failed however, to give him the slightest relief.

In the evening of the 27th of November he had again a sensation of great fulness in the left ear, and an increase in the tinnitus, and an hour afterward he was again totally deaf. I learned subsequently from his physician that he had prescribed the quinine in five-grain doses, to be taken three times daily.

On the morning following, the 28th November, I saw the patient for the first time. On examination I found that he was unable to hear my voice even through an ear-trumpet, and I therefore had to communicate to him in writing. Tuning-forks held in front of either ear were not heard, nor were they heard when placed in contact with the skull, although the vibration was felt. The patient, who is a very intelligent man, assured me that he was in no doubt about this. The tick of the watch (normal distance, 60 inches) was not heard when pressed against the auricle or the mastoid on either side. In both ears the external canal and the drum membrane were entirely normal. The Eustachian tubes were permeable. Inflation of middle ear caused slight bulging of the drum membrane, but no hyperæmia. Although confident that there was no fluid exudation in cavity of the drum, I thought it best to assure myself of the fact, and therefore made an incision in the posterior half of the drum membrane of the left ear. No

fluid escaped through the opening and on inflation nothing but air came through the wound. The patient was very dizzy and complained of great noise in the left ear and pain in the head.

There was no disease of the nose or throat. Examination of the eyes with the ophthalmoscope showed the optic disc and the retina to be quite healthy in both eyes. The urine contained neither albumen nor sugar, but was loaded with phosphates. There was no disease of the heart.

As quinine had already been given without producing relief, I concluded to try local depletion and applied six leeches to the left mastoid process. The patient was put to bed, and sinapisms were applied to his legs and feet. During the next six days the vertigo was almost constant, even while the patient was on his back in bed. The roaring diminished in intensity, but the deafness continued as before. The incision in the drum-head healed in two days. After that the middle ear was inflated daily, and quinine was given in five-grain doses three times daily.

From December 6th to January 3d, the patient was under the care of Dr. Lehlbach, to whom I am indebted for the following notes :

On December 18th, while the symptoms described above continued, the patient was attacked by very severe neuralgic pains, which started in the left forehead, and soon spread over the entire left side of face and neck, and to the teeth and gums of this side. This pain continued unabated for four days, and before it ceased the skin of the left side of the face became swollen and intensely red. This condition lasted for about four days and then gradually passed away. No herpes was observed, and no desquamation followed the attack. On the night of the second day after the commencement of the swelling of the face, the patient had another severe chill, which lasted some time, and was followed by heat and perspiration. While under Dr. L.'s care, he was treated at first with tincture of iodine, fifteen drops, and iodide of potassium $2\frac{1}{2}$ grains, three times daily, to which later were added eight drops of fluid extract of ergot. During the attack of neuralgia he was given quinine and morphine, and after this attack had passed over the tincture of iodine was resumed.

On January 3d I saw the patient again. He was still as deaf as when I last saw him. The vertigo had, however, diminished so much that he was able to work. The tinnitus continued, but

was not very annoying. He had still much pain in head at times. I prescribed iodide of potassium, ten grains, three times daily.

On March 3d he was still somewhat giddy occasionally, especially on raising his head after stooping, and his walk was not yet very steady. The tinnitus had slowly decreased in loudness. He was able to hear loud sounds, and sometimes could understand words shouted in his ear, but for all useful purposes he was as deaf as before. He thought that he heard a large C[♯] tuning-fork when held half an inch from external meatus of left ear, and also when placed on mastoid.

In February, 1884, about fourteen months after his first visit to me, he was able to understand loud words spoken directly into the left ear. When holding his hand behind the auricle and pressing it forward, he heard and understood all I said in a loud voice. He heard my watch when it was pressed against the auricle, but did not hear it from the mastoid. Politzer's acoumeter was heard two inches from ear and also from mastoid. The C[♯] tuning-fork was heard when placed on mastoid, but it was heard more distinctly and much longer when held half an inch from external meatus. No reaction of the auditory nerve could be obtained by a galvanic current of a new battery of ten cells. The patient was in excellent health, and was entirely free from headache.

The facts, that the hearing of the left ear was very acute before the initial chill, and that absolute deafness was very rapidly developed without the slightest objective signs of disease of the middle ear, make it tolerably certain, I think, that this case was one of primary disease of the nervous apparatus of the ear. As regards the nature of the morbid process it may be assumed that it was of an inflammatory character; the chill which preceded the first attack and the erysipelatoid inflammation of the face which was developed later in the disease leave little room for doubt on this point. It seems probable that this inflammation started in the cerebral meninges at the base, thence spread to the labyrinth, and later also to the Gasserian ganglion. The chill and the severe headache were probably caused by the circumscribed basilar meningitis; the first and second attacks of vertigo and deafness

by a sudden increase in the existing hyperæmia in the labyrinth ; and the last attack was, perhaps, the result of an extensive serous effusion into this structure. The neuralgia and the inflammation of the skin were probably due to hyperæmia or a slight inflammation of the Gasserian ganglion.

That the medulla oblongata was the seat of the inflammation seems improbable, as only the left organ of hearing was affected in this attack. There was at no time tinnitus in the right ear, and it may, therefore, be assumed that the nervous structures of this ear were not involved.

The view above stated as to the probable seat of the disease is, moreover, strengthened by the fact that the hearing for speech was partially restored while deafness for low tones remains.

Cases of this character must be rare, as the above is the only one that I have seen, so far as I can remember, in which Ménière's train of symptoms was ushered in with a chill, in an adult. Similar cases are not unfrequently met with in young children, but in every one that I have seen the hearing of both ears was totally destroyed. In children I have always looked upon the disease as a very mild form of cerebro-spinal meningitis, though it occurs not unfrequently at periods when no epidemic of this disease is prevailing. Occasionally, metastatic choroiditis of one or both eyes is developed in children in whom the symptoms of this form of meningitis are so mild that the parents do not think it necessary to employ a physician.

How much the treatment had to do with the partial recovery of hearing, it is of course impossible to say. I have seen, however, other cases of this kind in which the long-continued use of the iodide of potassium seemed to be of benefit.

CASE 2.—Ménière's train of symptoms, followed by neuralgia and erysipelatoid inflammation of the face.

A gentleman, forty-one years of age, came to me on the last day of October, 1882, for treatment of hardness of hearing. From his wife, who accompanied him, I learned that up to the time of

the attack, to be described further on, he had always been in excellent health, and of a jovial, cheerful disposition. The only additional fact worth noticing, relating to his previous history, ascertained from him afterward, was that about twenty years ago he had a chancre, for which he was treated with mercury ; no secondary symptoms followed. He is married, and has several healthy children. Two weeks before he came to me, he felt for the first time a rumbling and roaring in his right ear ; none was felt in the left ear. A week later he noticed that he was entirely deaf in the right ear. He has had no nausea or sickness of stomach, but during the last two weeks he has felt very giddy at times. Of late his gait has been so unsteady, that he has ventured out-of-doors only when supported by the arm of a friend. A most noteworthy feature and the most alarming symptom to his friends has been the very great mental depression and excessive nervousness under which he has been laboring during the past week. According to his own statement, as well as that of his friends, there is no cause for this in his family or business relations, and it must therefore be regarded as part of the disease from which he is suffering. He is unable to sleep, although he has no pain anywhere. His hearing was perfectly good in both ears before this attack, and he does not remember ever to have had otorrhoea.

On examination, I found that the *right* ear was totally deaf for speech, watch, and tuning-forks ; the latter, when placed on vertex or between the teeth, were heard only in the good ear. With the *left* ear he heard a whisper at about $\frac{3}{4}$ the normal distance, and the watch (60 inches) at 40 inches. Tuning-forks were heard equally well from mastoid as when held before external meatus. An attempt to ascertain the galvanic reaction of the right acoustic nerve had to be given up, as even the weakest current greatly increased the vertigo and the tinnitus.

Examination of the *right* ear revealed a normal external canal ; a dull, opaque, and somewhat sunken membrana tympani, the mobility of which was impaired. No hyperæmia of handle of malleus. Eustachian tube easily permeable. Sounds dry and broad.

In the *left* ear the drum-membrane was opaque and depressed, and contained in its posterior half a large, oval, depressed, and flaccid cicatrix. Tube permeable. Inflation caused marked bulging of cicatrix.

Although there was no evidence that the tympanic cavity of right ear contained a fluid exudation, I thought it best to remove all

doubts on this point by incising the posterior half of the drum-membrane.

No fluid escaped through opening, and on inflation only air came out of it.

Ophthalmoscopic examination showed the background of the eyes to be normal.

The urine contained phosphates in great abundance, but neither albumen nor sugar.

I advised rest in bed, and prescribed a combination of iodide and bromide of potassium.

Two days later the condition of the patient remained unchanged. The incision in the drum-membrane had healed. After this date inflation of the middle ear through the catheter was practised every other day, in addition to the other treatment.

On the 6th of November, the vertigo was more marked and more constant than previously, and all loud sounds were very painful to him.

Until the 15th no noteworthy change occurred. Then he complained of great neuralgic pain in the entire right side of the head and neck, which prevented him from sleeping. These parts were sore to the touch, and a few days later the skin of the right half of the face became very red and somewhat swollen. No irritating lotion had been applied to these parts. The redness and swelling subsided in four or five days, but the pain although less severe, continued for more than a month. No vesicles were visible during, and no desquamation followed, this attack.

Since then the tinnitus and the vertigo have troubled him only at times. The deafness of the *right* ear continues. His gait is still at times unsteady. The mental depression and the nervous irritability have in a large measure passed away. He is, however, constantly haunted by a fear of becoming totally deaf, as the good ear has occasionally a feeling of fulness and he imagines that its hearing is not as acute as formerly. Repeated examinations have, however, convinced me that there is no marked deterioration of hearing of this ear. During the last twelve months I have treated him off and on for naso-pharyngeal catarrh. In January, 1884, he was still in the condition last described.

This case is not unlike many others on record in this, that it is impossible to say how much of the deafness was caused by middle-ear disease. My patient was confident that

before the attack of tinnitus he heard as well with the right ear as with the left, if not better, and yet the condition of the drum-membrane would indicate disease of long standing. There can be no doubt, however, that after the attack of roaring in the ear, the hearing was rapidly destroyed; and as there were no signs of acute middle-ear disease it must be assumed that an affection of the nervous apparatus of the ear caused this destruction. For the reasons already given in discussing the first case, a disease of the medulla oblongata can probably also be excluded in this case, and the entire absence of febrile symptoms will doubtless be regarded as proof that a basilar meningitis did not exist. Yet cases are occasionally met with, especially in connection with chronic purulent inflammation of the middle ear, in which the only manifestations of a congestion if not inflammation of the membranes at the base are moderate headache and neuritis optica of one or both eyes, and it is therefore at least not impossible that in this case inflammation of the labyrinth caused hyperæmia of the cerebral membranes at the base and also of the Gasserian ganglion.

The above cases are the only ones that I have seen in which manifestation of irritation of the trifacial nerve occurred in connection with disease of the nervous apparatus of the ear, and so far as I know MOOS is the only author who has described similar cases. See *Virchow's Archiv*, Bd. 68, Heft III., p. 433, also MOOS: *Ueber Meningitis cerebrospinalis Epidemicus*, p. 28.

Case 3.—Sudden, complete, and permanent destruction of hearing of one ear.

Mrs. V., fifty years of age, a slender woman, with very pale complexion, the mother of many healthy children, who had always heard very acutely with both ears, and who had never had tinnitus, felt suddenly, while walking in a strong wind, a tremendous roaring in her left ear, and at same time felt a little confused in mind, but did not lose consciousness. She did not fall, and felt no nausea. Immediately afterward she noticed that she was unable to hear with this ear. The deafness and the tinnitus continued at the time she consulted me, ten days after the attack. On examination I found that she was unable to hear loudly spoken words with

the left ear. Politzer's acoumeter was heard two inches from this ear when the other ear was open, but not at all when this was tightly closed. The watch was not heard when pressed against auricle or held against mastoid. Large tuning-forks of different pitch were not heard when held before external meatus, but when placed on mastoid were heard in the other ear. Placed on vertex they were apparently heard on both sides.

The hearing of the right ear was perfect.

On inspection nothing abnormal could be discovered in the external canal or in the condition of the drum-membrane of either ear. The tubes were permeable, and inflation caused bulging of upper part of drum-membrane in both ears. There was no pharyngeal catarrh, and the patient's general health was good. She had only occasionally a slight feeling of giddiness. Her walk was as steady as ever. I ordered quinine in five-grain doses twice daily, and under this treatment the tinnitus speedily disappeared, but the deafness continued.

Four years later I saw the patient again and found the condition last noted unchanged. There had been no return of the tinnitus, but during the last two years she had at times felt slightly giddy.

The absence of marked vertigo was a noteworthy feature of this case, and would seem to make it probable that the disease was confined to the cochlea. A hemorrhage into the cochlea, or embolism of the cochlear branch of the arter. auditiva interna, may have caused the deafness.

A CONTRIBUTION TO THE PATHOLOGY AND PATHOLOGICAL ANATOMY OF THE EAR.

By DR. A. HEDINGER, OF STUTTGART.

Translated by EDWARD FRIDENBERG, M.D., New York.

IN view of the rarity of cases of fatal aural disease, in which clinical observation has been supplemented by careful post-mortem examination, the following communication, giving, in addition to the clinical history, the results of a careful anatomical examination in each case, may prove of interest.

The pathological specimens are four in number:

1. *Acute suppurative inflammation of the middle ear* on the left side, with perforation of the transverse sinus, the superior petrosal sinus, and the dura mater.
2. *Caries of the temporal bone* on the left side.
3. *Sclerosis of the middle ear* on the right side, *ankylosis* of all the ossicles.

Specimens 2 and 3 are derived from the same case, one of pulmonary phthisis.

4. *Aural hemorrhage* from the retro-maxillary fossa, due to a laceration of the external jugular vein and of branches from the internal jugular vein, the laceration being caused by a traumatic detachment of the cartilaginous portion of the external auditory canal from the bony portion. Death due to internal complications.

CASE I.—*Acute suppurative inflammation of the middle ear.*

History.—At the time of his admission to the "Katharine Hos-

pital" the patient, a man of powerful physique, had been suffering for several weeks. On admission: moderately high fever; a circumscribed painful swelling of the left parotid gland, in which indistinct fluctuation was felt on deep pressure, especially between the mastoid process and the ascending ramus of the lower jaw. A deep incision being made at this point, no pus was found. A second incision on the following day gave vent to a few drops of thick pus. On pressure over the swelling a large amount of pus now issued from the external auditory canal, the floor of which was bulged forward. The case seemed to be one of caries of the temporal bone. The attending surgeon, Dr. Von Gärtner, presuming an implication of the mastoid process in the disease, removed a piece of bone about the size of a pea by chiselling, without, however, finding pus. After lying in complete coma for twenty-four hours, the patient died.

Autopsy.—Much pus was found under the dura mater and in the arachnoid sac. The superior petrosal sinus was filled with cheesy pus and thrombi, and was the seat of an ulceration, ten *mm.* in length and three *mm.* in breadth. This ulcer communicated with the pyramid below the semicircular canals by means of an opening in the bone, through which a probe passed directly into the tympanic cavity and into the mastoid antrum. The transverse sinus was the seat of an ulceration, three *cm.* in length, ten to fifteen *mm.* in breadth. The ulcer was covered with cheesy pus, and its margins were prominent and eroded. The pia mater and arachnoid were intensely hyperæmic; remaining shreds of dura mater were thickened. There was marked hyperæmia, vivid injection, and some thickening of the tegmen tympani.

Above the antrum was a defect in the bone about the size of a pinhead, through which the probe entered in a forward direction into the mastoid antrum, which contained cheesy pus. The drum-head was thickened and the seat of two perforations: the one near the centre was oval in shape; the other, situated more eccentrically, of an oblong shape. The tympanic mucous membrane was thickened and granular. The malleus and incus were well preserved and of normal mobility.

The external auditory canal was narrowed throughout to a slit, and the bony portion was carious. The membranous labyrinth and cochlea were infiltrated and thickened. The facial nerve was not recognizable. At the apex of the mastoid process was a bony defect of the size of a pea.

Remarks.—The discharge of the pus into the lateral sinus, as well as into the superior petrosal sinus, was probably due to the small size of the openings found in the membrana tympani. In the earlier stages of the disease an incision into the drum-membrane connecting the two perforations might have provided sufficient drainage.

The sclerosis of the apex of the mastoid process explains the failure of the operator to find pus. Even with a normal mastoid process death could not have been prevented, as the erosion of the bony walls of the two sinuses showed that they had contained pus for a long time, and the shortest road to a free surface was in the direction inward.

In the absence of sclerosis a part of the pus might have found an exit in a downward direction. The sclerosis, however, was evidently not of a secondary character, *i. e.*, not caused by inflammation of the mastoid cells.

The supreme importance of this specimen lies in the fact that it shows how dangerous it would have been to open the mastoid process at the spot usually selected. In this case the operator would have simply fallen into the transverse sinus and caused immediate death.

CASE 2.—*Caries of temporal bone. Left ear.*

History.—The patient, a very nervous girl, with a family history of phthisis, had been subject to repeated attacks of hæmoptysis for several years. Three years ago she came to my clinic complaining of loud but painless noises of a roaring and tapping character in the left ear. The records read: Otitis media catarrhalis acuta dextra; pharyngitis et rhinitis chronica.

Status Præsens.—Right ear apparently normal. Hearing distance after compression-pump, $\frac{6}{8}$ ft. Tube pervious; fine crepitating sounds during inflation. Left drum-membrane opaque in spots and sunken. On inflation of middle ear, dome-shaped protrusion of upper half of membrana tympani with injection of its vessels. Tuning-fork placed on the head is heard louder on the right than on the left side; held in front of the ears, it is heard better on the left side. Chronic catarrh of nose and pharynx. No subjective noises during inflation.

Treatment and Course of Disease.—The daily use of the compression-pump was regularly followed by the above-mentioned

dome-shaped protrusion of the upper half of the drum-membrane, with as constant a return to its sunken condition during the intervals. On the fifth day a paracentesis was made, after which the protrusion diminished in size by about one half; the tinnitus became less marked for a few days, while the hearing distance remained unchanged. An attempt at aspiration with my aspirator was unsuccessful. The hearing distance on the right side sank to 100-50; the roaring and tapping sounds grew louder again.

A second paracentesis gave vent to some mucus; a few days later the secretion became purulent, but the hearing distance, instead of increasing, sank to 30 *cm.*, while the subjective noises, which had previously been heard at times only, became continuous. They now sounded like the boiling of water in a kettle.

In spite of the careful use of copper, salicylic acid, boracic acid, and chloride of zinc, the suppuration continued, giving rise to polypoid granulations in the tympanum and excoriations in the meatus. Chloride of zinc acted most beneficially on the granulations, parts of which during its use were occasionally swept away by syringing; yet seven full weeks had elapsed before a moderate improvement in the secretion and in the general condition was attained.

It was now noticed that the mass growing from the upper wall of the canal, which had been taken for a polypoid growth, was really the protruded and degenerated remnant of the drum-membrane. A prolonged and mild course of treatment, with salicylic acid and boracic acid used alternately, reduced the suppuration to a minimum, and cured the patient completely and permanently of her most distressing symptom, the subjective noises in the ear. While the latter did not recur, a small pedunculated polypus, starting from the remnant of the drum-membrane, was noticed a few days later. After the removal of part of it with the snare, the galvano-cautery was applied several times, with fairly successful results. This was followed, however, by an increase in the otorrhœa, the development of new granulations, swelling of the glands below the ear, and frequent attacks of pain in the entire left half of the head, accompanied with vertigo. Further treatment proved unavailing, and as the patient presented herself but rarely, the external canal was soon filled again with granulations. Finally, she was admitted to the "Diaconissenhaus" as a consumptive, and died there six months later of pulmonary phthisis.

Autopsy.—Membrana tympani entirely destroyed; bony portion

of meatus softened ; bony portion of Eustachian tube considerably dilated ; tegmen tympani carious. Between bulbus venæ jugularis and bony portion of Eustachian tube two fistulæ leading into pyramid. Tympanum enlarged by caries and filled with pus ; in its walls are seen the orifices of innumerable carious sinuses. Anterior wall of canalis caroticus is destroyed by caries, so that the membranous wall of the artery projects into the tympanic cavity. The carotid artery contains a thrombus, which is attached to the walls of the vessel by connective tissue. Stapes slightly movable ; its base thickened by bony deposit. Malleus of monstrous size, and drawn backward and upward apparently by tensor tympani muscle. Auriculo-temporal nerve visible. Mastoid antrum filled with cheesy pus.

Remarks.—Apart from the consideration of the pulmonary complication, instrumental interference would have been unavailing in this case, in which there was no retention of pus. On the contrary, the drum membrane being destroyed, the passage was unobstructed. Hence the carious process must have been due to causes not amenable to operative treatment, and an opening into the mastoid antrum would have simply evacuated the cheesy pus contained in this cavity, without retarding the progress of caries in the remainder of the ear.

This case, like many others of which I have clinical and autopsical records extending over a period of seventeen years, goes to prove that the indications for the perforation of the mastoid process have not yet been defined and formulated with sufficient precision. The correctness of this view is shown by a recently published book by Bezold, on the "Corrosion-Anatomy of the Ear," a work based on the author's ingenious method of injection. A careful study of this book, combined with the knowledge derived from anatomical preparations from fatal cases of aural disease, ought to lead to conservatism in treatment.

CASE 3.—*Sclerosis of the middle ear.*¹

The *autopsy* showed ankylosis of all the ossicles of the right ear.

Drum-membrane normal ; malleus, incus, and stapes absolutely immovable. The specimen further shows :

¹In this preparation the saw passed through the meatus internus.

Plexus Jacobsonii ram. communicans cum plexu tympanico, which consists, as is well known, of :

1. Nervus carotico-tympanicus.
2. Nervus petrosus profundus minor et superficialis major.
3. Ramus communicans cum ganglio otico.
4. Ramus communicans cum petroso superficiali majori et ganglio geniculato.

Tensor tympani markedly thickened ; musculus stapedius much thickened, sending connective-tissue bands in various directions, *e. g.* to the incus and to the stapes ; the latter pocket-shaped. The chorda tympani was visible.

Section through the cochlea showed infiltration and thickening of the basilar membrane.

The entire specimen presents a typical picture of the sclerotic form of chronic middle-ear catarrh, which gradually leads to complete loss of hearing, and it also illustrates the inadequacy of our therapeutic resources.

As the hearing distance was normal one year before death, we must assume an unusually rapid development of the sclerosis during the latter months of life. This rapid development of the sclerosing process, which, fortunately, is only rarely met with in such a marked degree, explains the absence of subjective sensations, *e. g.*, subjective noises, a symptom which would not have been wanting had the labyrinth been correspondingly affected. In their absence we are furthermore justified in locating tinnitus aurium and other subjective aural phenomena in the labyrinth chiefly. That these are not due to affections of the intrinsic aural muscles, especially abnormal contraction of the tensor tympani, is evident in this case, in which both tensor tympani and musculus stapedius were the seat of marked pathological changes. It also shows the futility of tenotomy of the tensor tympani, a mode of treatment fashionable some time ago, but now in a great measure forsaken. Attention should also be called to the nerves, which were in this specimen uncommonly distinct and prominent. This condition was probably caused by the atrophy of the lining membrane of the middle ear.

CASE 4.—Aural hemorrhage.

E. B., male, aged twenty-seven, fell from a roof, and died four hours later. Profuse hemorrhage from left ear. Separation of cartilaginous from bony meatus. Comminuted fracture of both knee joints. Venous hemorrhage from retro-maxillary fossa through external meatus. Rupture of spleen with internal hemorrhage.

Autopsy.—Marked injection of external ear and surrounding tissues. Meatus filled with coagula. External surface of temporal bone uninjured and normal, with the exception of marked venous hyperæmia of the periosteum. In the retro-maxillary fossa large extravasation of blood into and between the various tissues, rendering them indistinguishable.

At 1 *cm.* from the external meatus there is a detachment of the cartilaginous portion of the meatus from the bony portion, in the shape of a hole the size of a bean, infiltrated with blood and involving the entire anterior half of the meatus. Part of tegmen tympani translucent. Membrana tympani entire, dark blue in color, sunken inwardly, and almost in contact with the promontory, nearly obliterating the cavity of the tympanum, which is normal and contains no blood. Pneumatic spaces of temporal bone very hyperæmic. Eustachian tube contains a little watery secretion.

Aditus ad cellul. mast. normal; meatus auditor. int. and cochlea normal.

Remarks.—The hemorrhage from the ear was evidently caused by the rupture of the external jugular vein and probably also of the internal jugular vein, the blood from which found its way into the meatus through the aperture formed by the separation of the bony and the cartilaginous portions of the meatus. Death was due not to the aural hemorrhage but to the lesion of the abdominal viscera.

Ten years ago a specimen, very similar to the above in all respects, was referred to me for examination from the city hospital. In this case there was also a fracture of the base, not implicating the bony portion of the ear, with detachment of the cartilaginous from the bony portion of the meatus, and here, too, a profuse hemorrhage had occurred from the ear, although there was no lesion of the drum-membrane, of the middle ear, or of the internal ear. This point is of great importance from a medico-legal

point of view, as it has been customary to give a bad prognosis in all cases of aural hemorrhage following injuries to the head.

Aural hemorrhage may furthermore be caused by a fracture of the anterior wall of the meatus, due to impaction of the articular process of the lower jaw in its socket, an injury usually caused by a blow on the chin. My specimen shows conclusively that hemorrhage of this kind is not always moderate in amount, as stated by Koenig in his hand-book of surgery. Aural hemorrhage may therefore be presumed to proceed from the base of the skull only when the drum-membrane is ruptured, and the hemorrhage is both profuse and protracted.

An interesting case, probably belonging to the same category, was observed at the "Katharinenhospital" during 1870.

The patient, a male, aged fifteen, fell a distance of 20' striking on the right temple. Profuse bleeding from right ear and from both nares. On recovering consciousness after a few minutes, the patient vomited repeatedly. Examination (not by myself) revealed nothing but pain on pressure over right mastoid process. Three days after admission the patient insisted on leaving the hospital in spite of the protests of the attending physician, and went to work. He was not heard from again.

The bleeding from the ear and the pain on pressure in the mastoid region were probably due to a detachment of the cartilaginous portion of the meatus from the bony portion. These cases will be more clearly understood by a comparison with the following case, which is diametrically opposed in nearly all its features.

A man, while intoxicated, fell from the third story. He did not recover consciousness and died the day after. A small quantity of bright-red blood escaped from the ear. The autopsy was made hurriedly, but we are justified in presuming a rupture of the drum-membrane and a lesion of the labyrinth, from the fact that the brain and its membranes were markedly hyperæmic, and the left anterior cerebral fossa contained a large blood-clot. The

temporal bone on the left side was detached from the occipital bone, leaving a space a full line in breadth. The lungs were oedematous, the heart and the abdominal viscera exceedingly soft.

In this case we find fracture of the base with slight hemorrhage, in the others no fracture of the base but profuse hemorrhage, not arising from the internal ear or from the cranial cavity.

A CASE OF IVORY EXOSTOSIS OF THE ETHMOID CELLS—EXTIRPATION FROM THE ORBIT—DEATH—AUTOPSY—REMARKS.

By H. KNAPP.

(With five wood-cuts.)

THE ARCHIVES OF OTOTOLOGY, not confining their sphere to the auditory organ alone, but paying due attention to the pathology of the nose and pharynx, in which a large percentage of ear-disease originate, are, I think, a suitable place for communicating the history of the following case to those who take particular interest in such affections. It might with propriety be reported in an ophthalmological or a general medical journal, for a prominent feature of the disease was the encroachment of the osseous growth on the orbit, while its starting-point was the mucous membrane of the nose, where chronic inflammation led to the formation of polypi and an osteoma, and later to retention and degeneration of pus in the adjacent cavities, particularly in the sphenoid cells, a morbid condition which with an ordinarily innocent operation served to determine a fatal meningitis. The case under consideration furnishes a striking example that those physicians who in the progress of their career are impelled to devote themselves mainly to the cultivation of a special department of medicine, will, by nature herself, never be permitted to entirely divert their attention from the general system.

The history of the case is as follows:

Mrs. J. C., æt. forty-seven, of Ilion, N. Y., consulted me, Oct. 11, '83, for nasal polypi and orbital tumor. She looked some-

what delicate, but seemed to be in good general health. She had suffered for ten or twelve years from nasal polypi, for which she had been operated on several times, first in 1873, when she had only two of them. In 1876 she had a great many polypi removed without material relief. In 1881 a great many were again removed. For four months she felt comfortable. Then she noticed that the polypi grew again, increasing steadily until, at the time she presented herself, they had completely obstructed the left nostril, pushing the nasal septum into the right nostril in which, also, several polypi were located. Four months previously she had for the first time noticed on the nasal side of the left orbit a tumor which, increasing steadily, was now about as large as a cherry, of bony hardness, and immovably connected with the os planum. The eye was slightly displaced, but otherwise not affected.

My opinion was that both nasal cavities, particularly the left, were filled with polypi, and that the orbital tumor was either an expansion of the ethmoid cells by the polypous growths, or a more or less solid osteoma, springing from the wall of these cells. It seemed rational first to remove as much of the polypi as could be reached from the anterior and posterior nares, then to attack the ethmoido-orbital tumor through an opening made in the inner wall of the orbit, which opening, after the removal of the solid tumor, might be made available to clear the posterior and upper parts of the nasal cavities, as well as the frontal sinus, of the growths which probably would be found there likewise. Knowing by personal experience how difficult and frequently impossible it is to remove soft pseudoplasms from the pneumatic cavities surrounding the orbit, and fully appreciating the responsibility involved in the case under consideration, I advised the patient to ask Dr. R. P. Lincoln of this city to take charge of the removal of the polypous growths, stating that I was quite willing to undertake the removal of the hard tumor encroaching upon the orbit, if it should prove impossible or impracticable to remove it from the nose. I referred the patient to Dr. Lincoln, as I had at the last meeting of the American Laryngological Society seen him exhibit some patients in

whom he had removed large growths from the posterior nasal space so successfully that his procedures were highly commended by the society. (See *Arch. Laryng.*, iv., 4.)

Dr. Lincoln was kind enough to give me the following notes on the operations performed by him :

"Oct. 11, '83. I removed at my office, with a wire *écraseur*, a large part of the growths from each nostril, but did not complete the operation because of the great number present and the unusual amount of hemorrhage, though this was by no means excessive.

"During this séance the septum *narium* was found to be deviated to the right side. There was also discovered high up in the left nostril, on its outer aspect, a hard, immovable tumor, which was opposite to and evidently connected with the osseous tumor in the corresponding orbit.

"On the 15th and 18th the operation was continued, when the passages were apparently fairly well freed from polypi.

"As a result unimpeded nasal respiration had been secured and also a condition favorable to the contemplated operation for the removal of the orbital tumor.

"The amount removed by the wire was sufficient to fill a three-ounce bottle.

"The whole mucous membrane seemed to be a bed, from every conceivable point of which sprouted polypi of varying size. To remove them thoroughly was evidently a task requiring much time and perseverance. (The autopsy, however, afterward showed it to have been impossible.) It was therefore decided by the patient, with my approval, to discontinue the completion of this part of the treatment until the tumor in the orbital cavity had been operated on, after the recovery from which, we hoped, at the patient's convenience, to resume the eradication of the nasal polypi.

"Nov. 3d. Crystals of chromic acid were applied to the points of attachment of the polypi wherever practicable, and a cleansing and disinfecting wash containing carbolic acid and salicylate of soda was given the patient, to be used by herself."

Nov. 7th. The condition of the patient was as follows : Both nostrils were virtually free. The inner wall of the orbit projected toward the temple, so as to form a bony-hard tumor of about 8 mm. transversely, 25 mm. vertically, and 25 mm. antero-

posteriorly (*f. g. fig. 2*). The eye moved freely. In the upper part of the left nostril a hard, bony mass was felt, apparently the continuation of the orbital tumor. The eye was slightly pushed outward and forward (about 2 *mm.*).

The background of the eye ophthalmoscopically showed hyperopia $\frac{1}{8}$, the visual acuteness was $\frac{2}{8}$; that of the other eye $\frac{2}{8}$, and its refraction emmetropic. The vision of the left eye was not improved by cylindrical or other glasses. The optic-nerve entrance appeared very slightly raised. The retina showed in the neighborhood of the optic disc a peculiar corrugation in the shape of parallel curves the concavity of which was turned toward the optic disc, a picture such as I had never seen before. It was no detachment, but could be likened to the wrinkles in a healthy skin. On the nasal side there were several atrophic patches in the choroid. The background of the other eye was normal.

I performed the operation in the afternoon of Nov. 7, 1883, in the presence of Drs. H. B. Sands, Geo. F. Shrady, R. P. Lincoln, and several other physicians, at the N. Y. Ophthalmic and Aural Institute, assisted by the assistant surgeons, Drs. Pooley, Born, and D'Oench. The patient was kept under the influence of ether during the whole operation.

A curved incision was made from the junction of the middle and inner thirds of the brow, along the orbital margin toward the nose, down to the inner-lower corner of the orbit. It severed the tissues down to the bone, and at once exposed an ivory tumor piercing the os planum. The curved flap of integument was detached as a whole from the tumor, the nodular surface of which was carefully freed from the periosteum with a small hand chisel. The os planum all around the tumor was broken down with the same instrument. From its upper border some drops of thick pus and some polypoid masses escaped. The tumor was now grasped with a strong pair of bone forceps, but could not be pulled out before its connections with the bones of the ethmoid cells and with the nasal septum had been severed with the chisel. During the extraction of the tumor, which was done slowly and with slight rotatory movements, the periosteum of the nasal part of the tumor was gradually detached, so that the osseous mass came out as a whole, and perfectly clean.

The exploration of the wound showed the orbit and nasal cavity smooth and free from pseudoplasms, but from the frontal

sinus, which opened by a perforation of about 4 mm. in diameter, a soft polypus was projecting. It was scraped out with a sharp spoon, and proved to be a mucous polypus of 25 mm. in length, 20 mm. in breadth, and 4 mm. in thickness. The cavity of the sinus was explored with the spoon, but, aside from a very considerable enlargement, revealed no further abnormality.

I performed the operation without special antiseptic precautions, since experience has taught me that in this locality they are superfluous. An antiseptic dressing of the wound would have been an illusion anyhow, as the current of air during respiration passed through the cavity of the wound.

The whole external wound was closed with silk sutures, no provision for drainage being necessary, as the secretion could escape freely through the nose. A compressive bandage of absorbent cotton was applied over the eye and the region of the wound.

Nov. 8th. Patient felt comfortable the first twenty-four hours.

Nov. 9th. She passed a fairly good night, complaining, however, of some headache. Pulse 96. No rise of temperature. In the evening the headache increased, pulse quick. 0.36 quinine given.

Nov. 10th. Restless night, intense headache, thirst; temperature at noon 104.2° F.; pulse 96. Patient drowsy. Wound syringed out, through nose, with lukewarm salt water. No odor; no secretion; moderate swelling of lids, no swelling of conjunctiva; eyeball normal; vision good. Temperature in the evening, 102°. Patient answers questions slowly. 11 P.M. Patient difficult to arouse; occasional spasms of hands.

Nov. 11th. Patient more and more somnolent during the night; at 9 A.M. perfectly comatose, breathing rapidly. Pulse 160; temperature 104.6°. Ice applications to head. Stimulants. Patient continued to sink, and died at 11.30 A.M.

The *autopsy* was made in the afternoon of the same day by Dr. Prudden, Dr. Lincoln, and myself.

The cranium and dura mater were normal. The longitudinal sinus contained a small recent clot. The pia mater of the convexity on the right side was everywhere infiltrated with serum and pus, most intensely over the vertex. The convolutions were flattened. On the left side (that of the operation) the pia was likewise infiltrated with serum and pus, and the convolutions were flattened,

but less than on the right. The sero-purulent exudation was most marked along the longitudinal sinus, but well seen also along the large veins. On the base of the cerebrum was a moderate purulent infiltration of the pia, less on the left than on the right side, most marked along the larger vessels. The cerebral arteries were normal, except that a circumscribed collection of pus surrounded the right posterior cerebral. There was considerable serous infiltration in the left hemisphere, less in the right. The left lateral ventricle contained a large teaspoonful of bloody serum. The ependyma of both lateral ventricles was deeply congested, otherwise normal. Third and fourth ventricles unchanged. Substance of the cerebrum hyperæmic, that of the cerebellum and medulla the same in a less degree, otherwise normal.

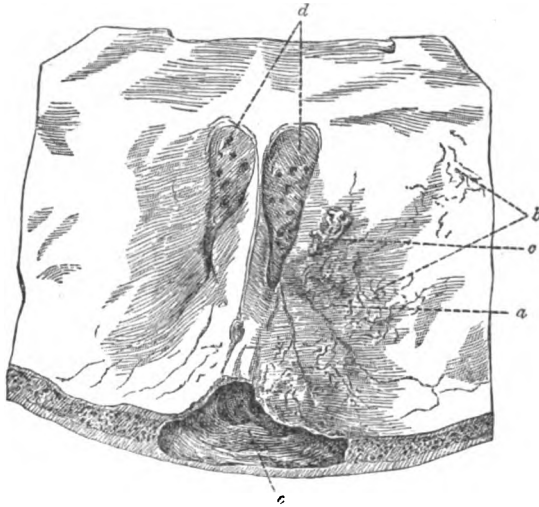


FIG. 1.

The cranial surface of the roof of the left orbit, near the crista galli, was blackish (fig. 1, *a*) to the extent of 3 *cm.* antero-posteriorly and 2 *cm.* laterally. The surface of the bone was smooth, but numerous small blood-vessels (fig. 1, *b*) were seen as short thin red lines to run through the superficial stratum of the bone, whereas but a few were visible on the other side. The bone was most discolored, and also some-

what rough, at the junction of the lamina cribrosa with the horizontal process of the left frontal bone, and there a portion of fibrous tissue containing a blood-vessel. (fig 1, *c*) pierced the bone, connecting the dura mater with the lining membrane of the left frontal sinus.

A portion of the frontal bone [fig. 1, superior (cranial) surface; fig. 2, inferior (nasal) surface;] was removed with saw and chisel, comprising the roof of both orbits, the lamina cribrosa (fig. 1, *d*), the ensiform processes of the sphenoid, 2 *cm.* of the vertical plate of the frontal, and the upper portion of the ethmoid (fig. 2) from the back of the nose to the body of the sphenoid. This piece, containing the whole region

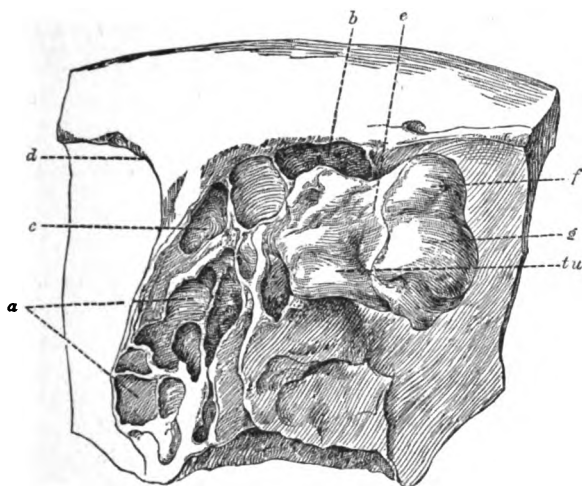


FIG. 2.

of the operation, was preserved for closer study. It laid the sphenoid and ethmoid (fig. 2, *a*) cells bare, and gave access to the left frontal sinus from above (fig. 1, *e*) and below (fig. 2 *b*). The right sphenoid sinus was empty, the left completely filled with an inoffensive soft cheesy substance, evidently penned up and decomposed pus and mucus, for the entrance to the sinus was plugged by means of a mucous polypus. (A few drops of similar substance had escaped through the upper part of the wound during the operation.)

The ethmoid cells on both sides were filled with polypi in all their numerous recesses.

The left frontal sinus (fig. 1, *e*) was enormously enlarged in every direction. It crowded the septum toward the right side, and extended between the outer and inner tables of the frontal bone, 5 *cm.* in the vertical, 3 *cm.* in the lateral, and 3.5 *cm.* in the antero-posterior direction, that is, as far as the blackish discoloration of the roof of the orbit. Its depth was greatest, 8 *mm.* in the middle line, between the eyebrows. It was partially filled with polypi, which, located in the lateral and posterior extensions of the cavity, had escaped the spoon during the operation. The right frontal sinus was of normal dimensions, empty, and communicated by a 6 *mm.* long, 5 *mm.* broad, opening (fig. 2, *c*), with the ethmoid cells near the upper-inner corner of the orbit (fig. 2, *d*).

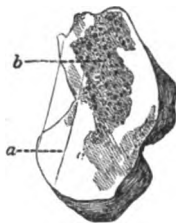


FIG. 3.

The contents of the left orbit were unchanged. The cellular tissue at the inner wall was congested, but free from inflammatory infiltration. The wound in the skin was well united, likewise free from infiltration. The tissues in the ethmoid cells from which the tumor had been removed were deeply congested, but free from purulent or any other alteration. At the nasal septum there was a round rough space, 12 *mm.* long, 8 *mm.* broad, evidently the basis of the osteoma.

The osseous tumor (fig. 2, *tu*, presenting the tumor in its natural situation), which had been removed by the operation, had an irregular, nodular shape. It measured 15 *mm.* at its base, 27 *mm.* vertically at its orbital end, and from 12 to 15 *mm.* antero-posteriorly. It was constricted in the middle (fig. 2, *e*), where the os planum had encircled it like a

collar. The orbital portion, which was the larger, was curved forward, and presented two knobs (fig. 2, *f, g*) separated by a horizontal furrow on the anterior surface.

The tumor (fig. 3) consisted, as was seen on a transverse section, for the greater (external) part of compact ivory-like bone (fig. 3, *a*); the smaller central part (fig. 3, *b*) was cancellous and vascular, of delicately spongy texture.

REMARKS.

The death of the patient was caused by acute purulent lepto-meningitis, which followed immediately upon the operation, and no doubt was induced by it. The pathogenesis is the same as the meningitis from mastoid disease with which we are so familiar. The cavity which paved the way from the site of the operation to the membranes of the brain was the left frontal sinus. This must have long been the seat of inflammatory action for it was distended in every direction. The polypous growths and the muco-purulent secretions retained in it enlarged in their increase the cavity by encroaching upon and destroying the diploëtic substance of the frontal bone, thus separating the inner from the outer table to a considerable extent. That the walls of the frontal sinus were in an inflammatory condition, and did not merely contain polypi, was demonstrated by the thick, purulent secretion which escaped when, during the operation, the sinus was opened; moreover, it was demonstrated by the condition of the bone substance. The black discoloration near the cribriform plate evidently was the result of an old process, whereas the hyperæmia in its neighborhood, still indicated in the specimen by the numerous congested blood-vessels visible in the superficial layer of the roof of the orbit, may have been of recent date. The pus contained in the left sphenoid sinus, resembling the cheesy substance so often found in the mastoid cells, was doubtless a very old formation, but so well locked up that it could not have had a direct influence on the intracranial inflammation. Its indirect influence, however, cannot be disregarded, for the presence of a collection of degenerated and decomposed

organic material in the vicinity of the field of the operation might have infected the wound. Yet this supposition had to be rejected on account of the perfectly aseptic aspect of the wound. The starting-point of the meningitis evidently was the frontal sinus. The diseases of this cavity, especially suppuration, have for more than a hundred years received deserved attention from medical writers, in proof of which I need only refer to the exhaustive paper of Steiner in *Langenbeck's Archiv für Chirurgie*, Bd. xiii., 1, p. 144, 1871.

In my own practice I have come across a certain number of cases of suppurative inflammation of the frontal sinuses. The majority of them recovered, after a spontaneous or surgical opening had given exit to the pus. Two cases terminated fatally in spite of the evacuation of pus at the orbital margin. In the one, the autopsy discovered an abscess in the frontal lobe¹; in the other, the patient died² under the same symptoms of abscess in the frontal lobes, but no autopsy was had. In one case, that of a young man, A. St., the opening (Feb., 1878) at the superior inner angle of the orbit, which bulged like an osteoma, liberated a large quantity of thin pus, and the exploration with a spoon discovered a large mucous polypus in the posterior recess of the sinus. It was removed, the cavity was syringed and drained eight months, then allowed to close, and a permanent cure was obtained.³ This case, as far as the disease of the frontal sinus is concerned, bears a great resemblance to the one under consideration.

Much less frequent than polypi and suppuration is the development of **osseous growths** in the pneumatic cavities in and around the nose. In a paper read three years ago before the N. Y. State Med. Society I compiled all the cases of osteoma of the frontal sinus that I could find in

¹ Described in ARCHIV. OF OPHTH., vol. ix., June, 1880.

² Aug., 1883. Mr. Whitlow, a colored man, of twenty-four years, had a large abscess at left brow. An incision evacuated a great quantity of pus. Cerebral symptoms followed for four months, then death. Only the uncertainty of locating the seat of the intracranial disease, *i. e.*, the supposed abscess, deterred me from opening the skull.

³ The case is described in ARCHIV. OF OPHTH., vol. ix., June, 1880. The gentleman has been well ever since.

literature. They were eleven in number. The operation had proved fatal in all but two. Since that time another case has been operated on and published by Tweedy.¹ I had the privilege of witnessing this operation. It proved likewise fatal by meningitis. A case operated on successfully by Richet has to be added to the above number. Cases of exostosis originating in the ethmoid cells are more numerous. They are comprehensively described in J. Solis-Cohen's text-book on the "Diseases of the Throat." Cohen bases his description principally on the admirable little pamphlet by Dr. Paul Ollivier: "*Sur les Tumeurs Osseuses des Fosses Nasales et des Sinus de la Face*," Paris, 1869. It is not my intention in this place to collect the literature on the subject, since this task, to a certain degree of completeness, has been done by R. Berlin in *Graefe-Sæmisch's Handbuch der Augenheilkunde*, vol. xvii., p. 725, 1880.

If we ask **what constituted the danger** in our case, what in particular **caused the death** of our patient, I would answer as follows: The chronic inflammation in the pneumatic cavities of the upper part of the face had led to a distension of the left frontal sinus and rendered its osseous wall congested and porous (ostitis) with beginning necrosis. The enucleation of the exostosis of the ethmoid cells, the opening of the frontal sinus, and the scraping out of its contents with a sharp spoon, had produced a sufficient irritation in the diseased walls of the sinus to incite a purulent meningitis. I abstain from the easy task of explaining the pathogenesis of the disease according to the modern views on infection. I want to remain on the basis of clinical experience.

Was the enucleation of the osteoma in itself the dangerous factor? R. Berlin (*l. c.*) considers the removal of osteomas to be an exceedingly dangerous procedure, as twenty-five per cent. of the cases compiled by him ended fatally. I have operated on five cases of exostosis of the orbital walls and the neighboring cavities. Two ended fatally,—a worse percentage. In spite of all this, I cannot hold the operative traumatism responsible for these un-

¹ "Royal London Ophth. Hosp. Reports," vol. x., pt. iii.

favorable statistics. In the case of an exostosis of the frontal sinus I opened this cavity much more extensively, and used the chisel a full hour before the operation was completed; the tumor was larger than the one under consideration, no antiseptic substances had been used, yet the wound healed by first intention, and the patient to-day, four years later, is well and hearty, without a trace of his disease,—even the scar in the skin is perceptible only on close inspection.¹

The most striking evidence that the traumatism in itself is not the dangerous element is furnished by the famous case published by Maisonneuve in the *Gaz. des hôp.*, 1863, p. 458. An ivory exostosis, springing from the ethmoid cells, had filled the whole orbit and pushed the eyeball completely out of its socket (fig. 4).² It was enucleated, with-

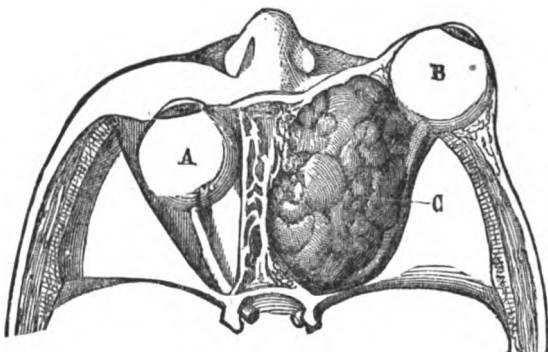


FIG. 4.

out antiseptic precautions, through an incision along the inner part of the brow down the side of the nose as far as the lower margin of the orbit. The eye was replaced and regained perfect mobility and sight. The wound healed, without fever, by first intention. The tumor (fig. 5) weighed 90 grammes, its antero-posterior dimension was 62 mm., its transverse diameter 40 mm., its vertical diameter 72 mm., its greatest circumference was 170 mm., its smallest 140 mm. Its surface was mammillary, very uneven. Now,

¹ Described in ARCH. OF OPHTHAL., vol. ix, p. 464, etc., 1880.

² Figs. 4 and 5 are reproduced from Maisonneuve's original publication. Fig. 4 is schematic; fig. 5 from a photograph. Figs. 1, 2, 3, 4, are life-size.

if tumors of such size can be successfully removed, neither the locality nor the traumatism can constitute the real danger.

The real element of danger is the long-prepared, diseased condition of the tissues surrounding the tumor. Where this exists, the operation may be the inciting cause of the meningitis or encephalitis—in other words, may give the impulse for the extension of the disease into the cranial cavity. The majority of these cases will, however, terminate fatally even though left alone. Proof—the mortality from chronic mastoid disease. Schwartze's eleven per cent. of death from opening the mastoid, in a series of 100 cases,

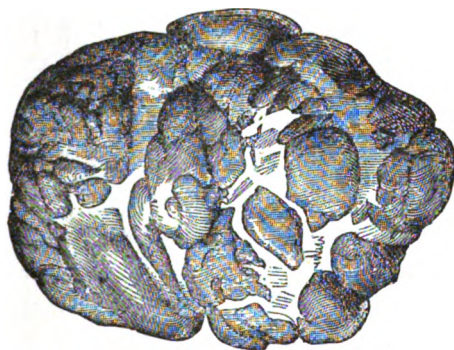


FIG. 5.

demonstrate the same proposition. Chiselling through healthy bone is not dangerous, whereas the consequences of chronic suppurative mastoiditis are of the gravest nature.

The practical rules to be deduced from the history and post-mortem condition of the case under consideration and from the study of similar cases are:

1. Nasal polypi, if allowed to grow, may multiply and spread to such an extent that their removal becomes utterly impossible.
2. They may cause chronic inflammation of the osseous walls and distention of the pneumatic cavities, the most important of which are the frontal sinuses.
3. Osseous tumors, which develop in comparatively

healthy pneumatic cavities, can be removed with safety,—that is to say, the operative traumatism does not constitute an element of particular danger.

4. The removal of osseous tumors from pneumatic cavities with diseased osseous walls, is dangerous by causing the inflammation to extend into the cranial cavity, and often proves fatal by acute (traumatic) meningitis and encephalitis.

TABLES SHOWING THE RESULTS OF AN EXAMINATION OF THE HEARING POWER AND MEMBRANÆ TYMPANI OF ONE HUNDRED AND FORTY-SEVEN DEAF-MUTES, WITH A STATEMENT OF THE CAUSES ASSIGNED FOR THEIR LOSS OF HEARING.

By D. B. St. JOHN ROOSA.

IN the year 1867, in conjunction with the late Dr. George M. Beard, I examined 296 deaf-mutes with a view of contributing something to our knowledge of the causes of deaf-mutism. The results of these examinations were meagre, and they were made to appear even less complete than they were in reality, because the editor of the journal in which they were published¹ could not give us the space to publish the tables upon which our conclusions were founded, and because the tables were lost so that they could not be published elsewhere. Since the use of the tuning-fork has come to play such an important part in aural diagnosis, it has been made available also in the examination of deaf-mutes. De Rossi,² of Rome, has made the most complete examinations of which I know, as to the hearing-power of deaf-mutes. He examined seventy individuals with the speaking-tube and tuning-fork. Twenty-seven heard the voice, four the watch, thirty-nine the tuning-fork vibrating in the air. Nearly all of the seventy perceived the vibrations through the bones, eleven only had no perception by bone-conduction, and De Rossi found

¹*American Journal of the Medical Sciences*, vol. liii., p. 399.

²Relazione sopra l' Ospizio dei Sordi-Muti de Roma. Quoted by Hartmann. "Deaf-Mutism." Translation, p. 84.

only three cases of what he termed total deafness. These examinations of De Rossi seem to me to furnish more reliable data than the cases of Toynbee and Kramer, and chiefly because the examination by the tuning-fork and speaking-tube was not made by them. Accordingly, I have imitated the examinations of De Rossi in those I have made. The imitation was an unconscious one, however, for it was not until I had nearly finished my examinations, that I found from a scanty reference in Hartmann's book on deaf-mutism, that De Rossi had preceded me in these tests.

While, as an otologist, I have but little interest in the modes of education of deaf-mutes, a description of which forms so much of what is said about them, I am exceedingly anxious to learn the seat of the lesion which causes the deafness, as well as the exciting causes of the aural disease and the hearing power. The tuning-fork seems to me a very important means of determining the seat of the lesion in cases of impairment of the hearing in which mutism does not result. I was desirous to know what it would indicate in those who are dumb as well as deaf. I found in the institution for the improved instruction of deaf-mutes in this city, the most ample opportunities for examinations. Every facility was afforded me by the principal, Mr. Greenberger, and I desire to thank him not only for the advantages he so liberally afforded me, but also for his valuable assistance given in a truly scientific spirit. I was also assisted by Dr. J. B. Emerson and Dr. George J. Bull, without whose aid, I should not have been able to accomplish the work of examining so many pupils. I used a "C'" tuning-fork in the examination as to the aërial and bone-conduction. The tests by speaking-tube were made by Mr. Greenberger, and I have relied wholly upon his statements as to that point.

147 Cases of Deaf-Mutism.

TABLE I.—Causes Stated by Parent or Guardian.

	No.		No.
Born deaf	44	Whooping-cough	2
Cerebro-spinal meningitis	27	Spinal trouble	1
Scarlet-fever	16	Mumps	2
Brain fever	13	Pneumonia	2
Meningitis	4	Gastric-fever	1
Measles	7	Cholera infantum	1
Fall on head	7	Intermittent fever	1
Unknown	7	Syphilis	1
Convulsions	4	Varioloid	1
Hydrocephalus	3		
Fever	3		147

In regard to this table, I can only say that it is as reliable as any that it seems possible to get from any institution. As far as the statements as to scarlet-fever, measles, cerebro-spinal meningitis, meningitis, mumps, and syphilis go, I think it may be considered trustworthy. When we enter the domain of congenital deafness, or such causes as "spinal trouble," "fall on head," "convulsions," there is great uncertainty as to the actual cause. Yet these causes are taken from blanks carefully filled out by the parents or guardians, many of them very intelligent people of the higher walks of life, who send their children to be under Mr. Greenberger's care. The causes are more accurately given, than in the other institutions in which I have made examinations. It will be seen there were only fifty-one cases, adding together the congenital and "unknown," or a little more than thirty per cent., which may, with much probability, be considered congenital cases. In our tables of 1867, we classified sixty-one per cent. as congenital cases. Hartmann's tables¹ show that of 8,404 deaf-mutes 5,546, or more than sixty-five per cent., were considered as congenital cases. His statistics are apparently made up largely of official and not personal examinations; for in the examinations made in Berlin by Hartmann himself, one hundred and eighty-five in number, only forty-five

¹ P. 64, *loc. cit.*

are classified as congenital cases; and those made by Cohn, in Breslau, show about the same proportion—that is, of one hundred and thirty deaf-mutes, fifty-seven are said to have been born deaf, while in other parts of Germany, and in Ireland, the proportion of congenital cases is much larger. I regard the official tables of all countries as valueless, except as to the total number of deaf-mutes. Those who collect them, are usually entirely incompetent for the sifting of evidence necessary to get even approximate truth upon this point.

TABLE 2.—RESULTS OF THE EXAMINATION WITH THE TUNING-FORK C³ OF 147 DEAF-MUTES.

<i>There was no aërial conduction on either side, while bone-conduction existed in</i>	74 cases.
<i>Bone-conduction on one side, both bone and aërial on the other in</i>	1 case.
<i>No bone or aërial conduction on one side. Bone-conduction on the other.</i>	10 cases.
<i>Bone and aërial conduction, both sides</i>	7 “
<i>Bone and aërial c. on one side ; bone on the other</i>	13 “
<i>Neither bone nor aërial c. on either side</i>	12 “
<i>No bone or aërial c. on one side. Both bone and aërial on the other</i>	1 case.
<hr/>	
	118 cases.

In twenty-nine cases the subjects were so young or were otherwise incapacitated for intelligent answers, so that no conclusions could be formed, except that the large majority of them probably heard the tuning-fork by bone-conduction.

From this table I conclude that the impairment of hearing in seventy-four of the one hundred and eighteen cases was due to diseases of the middle ear alone. In twenty-six additional ears there was disease of the middle ear alone—that is, sounds were not heard through the air at all, but only through the bones. In twelve cases, or twenty-four ears, there was, I conclude, disease both of the middle and internal ears. In eleven additional ears there was also the same condition. In the seven cases and fourteen ears where there was both aërial and bone-conduction, I con-

clude that there was disease both of the middle ear and the nerve. In the thirty-five ears in which there was neither aërial nor bone-conduction, we may conclude either that there was disease of the nerve alone, or of both middle ear and the nerve—for disease of the cochlea of a complete type would probably obliterate the perception of sound. Yet even here disease of the middle ear might also exist. I will now present a series of tables made in consonance with the supposed cause of the deafness.

TABLE 3.—*Scarlet-fever being cause of deafness, condition of membrana tympani.* 16 cases, 32 ears.

Absent	1
Opaque and cicatricial	4
Sunken, opaque, small or no light spot	11
Perforate and ulcerating	9
Congested	2
Neoplastic and perforate	1
Neoplastic	2
Not well seen	1
Perforate, no discharge	1
	<hr/>
	32

Tuning-Fork Test.

No aërial conduction but bone-conduction	17
Bone and aërial conduction	3
No bone or aërial conduction	8
Unreliable	4

Age of patients at time of suffering from disease and becoming deaf:

From 2 to 3 years	2
“ 3 “ 4 “	8
“ 4 “ 5 “	3
“ 5 “ 6 “	1
“ 6 “ 7 “	1
“ 8 “ 9 “	1
	<hr/>
	16

There is in these scarlet-fever cases a large proportion—8, —or one in 4, where disease of the nerve certainly existed. It will also be remarked that there is a large proportion of

cases of ulcerative disease. That an ulcerative disease of the tympanum may more readily involve the internal ear than a plastic or catarrhal inflammation, is probably true. Yet the starting-point of otitis in scarlet-fever is usually the middle ear.

TABLE 4.—*Measles cause of deafness; condition of membrana tympani. 7 cases, 14 ears.*

Sunken, no light spot, opaque	5
Congested	1
Sunken light spot	1
Not well seen	5
Opaque, but good light spot	2
	<hr/>
	14

Tuning-Fork Test.

Bone-conduction but no aërial conduction	6
Bone and aërial conduction	1
No bone or aërial conduction	1
Unreliable	6
	<hr/>
	14

It will be noted that only one case occurs here of those of whom a reliable test could be made, in which it is possible that disease of the nerve alone exists—that is the case in which there was neither bone nor aërial conduction.

Age at which disease of deafness occurred :

Under one year,	3
From 1 to 2 years	3
“ 2 “ 3 “	1

TABLE 5.—*Cerebro spinal meningitis cause of deafness; condition of membrana tympani. 27 cases, 54 ears.*

Cicatricial	6
Opaque	6
Sunken, fair light spot	10
“ good color	8
“ small or no light spot	16
Not well seen	3
Opaque, good light spot	1
Cicatricial and perforate	2

Congested and sunken	1
Congested	1

54

Tuning-Fork Test.

Bone-conduction only ; no aërial conduction	34
Bone and aërial conduction	5
Neither bone nor aërial conduction	8

47

Unreliable	7
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Here the proportion of cases in which it may be conjectured that the nerve alone is involved, was not as large even as in scarlet-fever. There were only eight ears of a total of fifty-four, or about one in seven. It is in this disease, that an affection of the nerve has been often assumed to be the most frequent cause of the deafness.

My clinical experience has been against this view, and I believe that the few post-mortem examinations that have been made of persons with aural disease in cerebro-spinal meningitis, go to support the view of that experience, which is that a lesion of the middle ear, is in a large percentage of cases the cause of the deafness.

TABLE 6.—*Deafness said to be congenital ; condition of membrana tympani. 44 cases, 88 ears.*

Normal color and light spot	11
Sunken, opaque, or no light spot	34
Obscured by wax	10
Opaque, large light spot	1
Sunken, opaque, but good light spot	14
Congested, sunken, and small light spot	5
Obscured by narrow canal	6
Cicatricial and perforate	3
Opaque, calcareous	1

88

Tuning-Fork Test.

Bone-conduction, but no aërial	48
Bone and aërial	8
Neither aërial nor bone	14
Unreliable	18

88

Here the proportion of cases of nerve or central disease is quite high—fourteen to forty-eight, or a little more than one to three. Yet even here, disease of the conducting apparatus largely predominates.

TABLE 7.—“Brain-fever,” “inflammation of brain,” “meningitis,” and “congestion of brain” said to be the cause of deafness ; condition of membrana tympani. 15 cases, 30 ears.

Sunken, opaque, small, or no, or double light spot	12
Normal	1
Sunken, good color, good light spot	7
Cicatricial	4
Not well seen	3
Perforate and ulcerating	3
	<hr/>
	30

Tuning-Fork Test.

Bone-conduction only	18
Aërial and bone	4
Uncertain	8
	<hr/>
	30

Age of patients when deafness occurred :

Less than one year	2
From 1 to 2 years	5
“ 2 “ 3 “	1
“ 4 “ 5 “	2
“ 5 “ 6 “	1
“ 6 “ 7 “	3
“ 8 “ 9 “	1
	<hr/>
	15

TABLE 8.—Fall on head cause of deafness ; condition of membrana tympani. 7 cases, 14 ears.

Not well seen	5
Sunken, opaque, fair or good light spot	2
Sunken, no light spot	2
Good light spot but sunken	2
Sunken, congested	1
Good light spot	1
Small “ “	1
	<hr/>
	14

Tuning-Fork Test.

Bone-conduction only	8
Neither bone nor aërial	1
Bone and aërial conduction	1
Unreliable	4
	<hr/>
	14

TABLE 9.—*Cause unknown. 7 cases, 14 ears.*

Opaque, sunken, good light spot	4
Not well seen	1
Opaque	1
Good color, fair light spot	1
Small light spot	1
Opaque and sunken	2
Sunken, small light spot	2
“ good light spot	1
Opaque, good light spot	1
	<hr/>
	14

Tuning-Fork Test.

Bone-conduction only	10
Uncertain	4
	<hr/>
	14

TABLE 10.—*Convulsions cause of deafness ; condition of membrana tympani. 4 cases, 8 ears.*

Opaque, small light spot, good color	2
“ sunken, good light spot	2
“	2
“ small light spot	2
	<hr/>
	8

Tuning-Fork Test.

Bone-conduction only	5
Aërial and bone-conduction	3
	<hr/>
	8

Age at which deafness occurred :

Less than 1 year	1
From 1 to 2 years	3
	<hr/>
	4

TABLE 11.—*Syphilis cause of deafness ; condition of membrana tympani. 1 case, 2 ears.*

R. M. T. much sunken, no light spot ; left slightly sunken, medium-sized light spot.

Tuning-Fork Test.

Right, no aërial conduction, but bone-conduction ; left, same.

In this case, the only one found, there was a syphilitic history ; notched teeth ; the subject has had interstitial keratitis. The disease seems to be confined to the middle ear.

TABLE 12.—*Hydrocephalus : condition of membrana tympani. 3 cases, 6 ears.*

Not well seen	1
Sunken, perhaps perforate	1
Sunken, small light spot	2
Opaque, no light spot	2
	<hr/>
	6

Tuning-Fork Test.

Bone-conduction only	6
Age :	
Less than one year	1
From one to two years	1
Unknown	1
	<hr/>
	3

TABLE 13.—*Spinal meningitis ; condition of membrana tympani. 3 cases, 6 ears.*

Not well seen	2
Sunken, opaque, good light spot	1
Opaque and cicatricial	1
Sunken, no light spot	2
	<hr/>
	6

Tuning-Fork Test.

Bone-conduction only	6
Age :	
From 2 to 3 years.	1
“ 5 “ 6 “	1
“ 6 “ 7 “	1
	<hr/>
	3

TABLE 14.—*Varioloid ; condition of membrana tympani.* 1 case,
2 ears.

Not well seen	1
Good color, good light spot, sunken	1
	<hr/>
	2
<i>Tuning-Fork Test.</i>	
Aërial and bone-conduction	1
Bone-conduction only	1
	<hr/>
	2

Age at which deafness occurred : one year and four months.

TABLE 15.—*Pneumonia ; condition of membrana tympani.* 2
cases, 4 ears.

Sunken, small light spot	1
Not well seen	1
Opaque, sunken, no light spot	2
	<hr/>
	4

Tuning-Fork Test.

Bone-conduction only	2
Uncertain	2
	<hr/>
	4

Age :

Less than one year	1
From one to two years	1
	<hr/>
	2

TABLE 16.—*Whooping cough ; condition of membrana tympani.*
2 cases 4 ears.

Good light spot, sunken, opaque	1
Opaque, small light spot	1
Sunken, good color	1
Sunken and congested	1
	<hr/>
	4

Tuning-Fork Test.

Uncertain	1
Both aërial and bone-conduction	1
	<hr/>
	2

Age :

"In infancy"	1
Whooping cough, intermittant fever at 2 years 9 months	1
	<hr/>
	2

TABLE 17.—*Cholera infantum* ; condition of *membrana tympani*.
1 case, 2 ears.

Sunken, no light spot	11
---------------------------------	----

Tuning-Fork Test.

Bone-conduction only	2
Age, one year.	

TABLE 18.—*Gastric fever* ; condition of *membrana tympani*. 1 case, 2 ears.

Sunken, opaque, small light spot	1
Sunken, good color, small light spot	1
	<hr/>
	2

Tuning-Fork Test.

Bone-conduction only and that feeble	2
Disease at 2 years and 8 months.	

TABLE 19.—*Intermittent fever* ; condition of *membrana tympani*. 1 case, 2 ears.

Small light spot	2
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Tuning-Fork Test.

Bone-conduction only	2
Intermittent fever and spasms at 2 years.	

TABLE 20.—*Mumps cause of deafness* ; condition of *membrana tympani*. 2 cases, 4 ears.

Right <i>Mt</i> opaque, small light spot ; left <i>Mt</i> , fair light spot, good color, sunken	1
R. <i>Mt</i> and L. <i>Mt</i> cicatricial	2

Tuning-Fork Test, Unreliable.

Age :

A few months old	1
6 years	1
	<hr/>
	2

TABLE 21.—*Fever cause of deafness ; condition of membrana tympani.. 3 cases, 6 ears.*

Sunken, two light spots	2
Sunken, small light spot	2
Opaque, small " "	1
Cicatricial	1
	<hr/>
	6

Tuning-Fork Test.

Both aërial and bone-conduction	2
Bone-conduction only	4
	<hr/>
	6

Age :

9 months	1
5 years	2

TABLE 22.—*Cases in which words or letters could be heard through a speaking-tube placed in the ear ;¹ condition of membrana tympani. 16 cases, 32 ears.*

Opaque	6
Sunken	15
Good color	4
Good light spot	8
Small " "	6
No " "	6
Two " spots	1
Cicatricial	5
Calcareous	1
Vascular	1
Perforated	2
Not well seen	3

Tuning-Fork Test.

Both aërial and bone-conduction	4
Bone only	2
Bone both sides, aërial on one side	3
Bone and aërial on one side, neither on the other	1
Neither bone nor aërial on either side	2
Unreliable	4
	<hr/>
	16

¹ In this table the various appearances of the membrana tympani are noted without regard to the number of ears.

Disease Causing Deafness.

Born deaf	.	.	.	.	.	.	.	.	5
Measles	.	.	.	.	.	.	.	.	4
Cerebro-spinal meningitis	.	.	.	.	.	.	.	.	3
Brain fever	.	.	.	.	.	.	.	.	1
Convulsions	.	.	.	.	.	.	.	.	1
Scarlet-fever	.	.	.	.	.	.	.	.	1
Unknown	.	.	.	.	.	.	.	.	1

 16

To this last table, the words of Mr. Greenberger should be added :

"The speaking-tube is used in these cases to assist the scholars to speak better after they have learned to pronounce them from the lips. There is not a pupil in the school who could be taught to speak a word from hearing it through the tube alone, but they will recognize words with which they have become familiar through lip-reading."

The complete tables of the 147 cases, with remarks upon many of them, will be published in the new edition of my work on the ear, now in the press. I am far from thinking that the tables here published form complete data, but I think they may assist in the determination of the lesions found in deaf-mutism. This much can be said at any rate : those who study them, will be looking upon a mirror reflecting what is seen on examining deaf-mutes who are intelligent enough to be educated. The deductions may be different, by different observers, but the facts will remain.

REVIEWS.

Die Corrosions-Anatomie Des Ohres. Von Dr. FRIEDRICH BEZOLD, Privatdocent der Ohrenheilkunde in München. Mit 6 Tafeln in Lichtdruck. Munich: Theodor Riedel, 1882. Reviewed by H. Steinbrügge, Heidelberg.

Bezold's work on the anatomy of the ear, as demonstrated by the corrosion method, is one of the books dedicated by the Medical Society of Munich to the Würzburg University, on the occasion of its anniversary festival; and it really presents a festive appearance as regards its exterior, the printing, and the plates. But in another respect, too, it deserves the appellation "festive," celebrating as it does the worthy conclusion of years of persevering labor and diligent study. As early as 1877, the Reviewer had the opportunity, at the meeting of German Naturalists and Physicians at Munich, in the Otological Section, to witness the interesting exhibition of numerous specimens of the human ear prepared by the corrosion process by Bezold. If we bear in mind that since that time the author has extended his views more and more by the preparation of new specimens, and by the often repeated examination and comparison of the same; and that he decided only a short time ago to publish the total results of his investigation, the above appellation chosen by us will certainly be admitted as justifiable.

It will hardly be questioned that this method of examining the temporal bone forms an almost indispensable supplement to the anatomical views gained from sections. The author proves this most clearly by the description of the external canal; the sections from which its lumen was formerly almost exclusively studied, were made in parallel places, and as they struck the basis of the curved canal only in parts, could no more give a picture of the canal that was true to nature than horizontal and vertical sections through the external meatus *alone* would enable us to form a correct idea of the dimensions of the narrow and wide portions.

Thus was verified Hyrtl's statement that sections are instructive only in cavities of *regular* form, that plastic casts alone are capable of faithfully reproducing all the irregularities of the cavities which constitute the middle ear. But if this was true of the cavities subservient to the sensory function, Bezold at once recognized that the corrosion method likewise must be the best means of studying the relation and connection of the pneumatic and spongy cellular spaces present throughout the temporal bone, the knowledge of which, with regard to the extension of pathological processes is, as is well known, of the greatest importance. The author has, therefore, directed particular attention to these spaces in the production of his casts ; and as macerated temporal bones are especially adopted for making casts of these spaces, while for casts of the middle ear mainly specimens the soft parts of which had been preserved, were used, he makes a distinction between the corrosion anatomy of the soft parts and of the bones, and divides his paper accordingly ; the first part comprising the *description of preparations of the soft parts obtained by the corrosion method, the second that of preparations of the bony parts obtained in the same way.*

The *first part* begins with directions for the preparation of such specimens, and in four subsequent sections contains the description of the auditory meatus, the tube, the drum cavity with the mastoid antrum, as well as of the remaining pneumatic spaces. If we may direct attention to some results of the investigation which are of material interest, it should be noted, first, in reference to the auditory canal, that Bezold makes its anterior wall commence at the margin of the tragus, from which results a double, zigzag bend of the canal, and instead of the usual assumption of four walls, based on the fact that cross sections throughout represent an almost oval shape, he describes only a posterior and an anterior wall which, to be sure, corresponding to the screw-like twist of the canal, change to postero-superior and antero-inferior ones at its inner end. The widest part of the meatus is found at its entrance, then it gradually becomes narrower, especially in height, to the inner end of the cartilaginous part ; a second dilatation occurs rather suddenly, at the beginning of the osseous canal, which is again followed by a decrease in the diameter, particularly of the lesser one further inward. The anterior lower wall in the osseous part forms an almost even plane, while the posterior upper one maintains its vaulted shape, so that sections made vertically to the axis here represent not an

oval, but a tunnel form. If we imagine such a section carried through the farthest outward point of the posterior upper periphery of the membrana tympani (termed the external pole), then the shorter diameter (height) of the tunnel measures on the average only 4.6 *mm*. Hence there is here a considerable narrowing as regards the lesser diameter, which is not participated in, however, by the other, and the author correctly calls attention to the origin of the one-sided, partially erroneous statement, that a dilatation of the passage occurs at this point, because the view was generally based on horizontal or oblique sections, which struck the direction of the *greater* diameter. Upon these anatomical data are based the practical hints which the author adds here for the extraction of foreign bodies. After a brief discussion of the morphological varieties of the external canal, from which we learn that they become rarer in the direction from without inward, we find a tabular arrangement of the longitudinal measurement of the auditory canal and its several divisions, as well as of the diameters of the lumina throughout their extent, based on twenty-one specimens and averaged. The same table contains the measurements of both diameters of the membrana tympani, as well as the size of the angle formed by the membrane with the anterior inferior wall. The mean distance from the posterior edge of the entrance to the point of the umbo was found by Bezold to correspond pretty closely with v. Tröltsch's measurement, averaging 23.4 *mm*. The same harmony exists respecting the longer and shorter diameters of the membrana tympani. On the other hand, the longitudinal measurement of the cartilaginous portion of the posterior wall is surprisingly small, amounting to only 4.46 *mm*.

Bezold's method for determining the angle formed by the membrana tympani with the anterior wall is very interesting. It is shown that the greater diameter of the membrana tympani meets its above-mentioned external pole; the vertical distance of this point from the anterior lower wall (narrowest point, see above) can moreover be easily measured on casts, and a plane carried through these two lines would strike the anterior lower wall in such a way as to form an approximately right-angled triangle. Therefore the quotient of the greater diameter of the membrana tympani (hypotenuse) with the vertical line (opposite side) represents the sinus value of the angle in question. In this way the author calculated the angle on various specimens, and found it to be $27^{\circ} 35'$. If we could take as a basis the quotient of the average values of the *lines* mentioned, viz., $\frac{4.6}{9.2}$, we would

obtain the easily remembered number of 30° . Unfortunately the section of the anterior lower wall does not form an exactly straight line, but has a slight downward curve, so that the size of the angle would be rather less. The author also mentions Sappey's statement, who determined the angle to be only $20-25^{\circ}$. At any rate, these undoubtedly correct measurements differ considerably from those of other authors (Huschke, 55° ; Tillaux, 45°).

Of the Eustachian tube, the osseous part is adapted for making casts, but not the cartilaginous part, because the casts of the latter, if they succeed at all, represent the tube not at rest, but in a state of dilatation. After a thorough description of the preparations obtained by him, there follows on page 30 a second table, in which are given the longitudinal measurements of the tube, the height of the two ostia, the distance of the isthmus from these, and the dimensions of the latter. The numbers found correspond pretty closely with those given by previous writers. Surprising, however, is the result obtained in reference to the isthmus which Bezold found on the average 3 *mm.* high, while its transverse diameter in eight specimens out of twelve measured only $\frac{1}{2}$ *mm.* and even less, so that in many cases it seems to form merely a fine fissure; it is, therefore, not surprising that even the thinnest bougies are arrested there.

The drum cavity and antrum are considered by the author as one continuous space. As regards the form of the drum cavity, Henle's comparison of it to a low cylinder bounded by concave terminal surfaces appears most nearly correct. Inasmuch as, for the purpose of opening the cavum tympani, the roof is generally chiselled off, its inner surface is generally lost to the examination. For this reason it is probably but little known that a bony ridge, the "*crista transversa tympani*," as Bezold calls it, runs transversely over the centre of the roof of the drum cavity, from which a fold of mucous membrane, previously described by other authors, extends to the tendon of the tensor tympani muscle. This projection appears in plastic casts as a fissure extending across the front. The bony ridge was indicated on all the preparations by such a furrow, while the duplicature of the mucous membrane seemed to be absent now and then. Immediately backward of this ridge begins the *aditus ad antrum*. Interesting is also the description of a specimen on which could be recognized an uncommonly large *bulbus venæ jugularis*, in connection with which the author takes occasion to call to mind the paper of Moos on the origin of subjective noises and hallucinations of

hearing (ARCH. OF OPHTH. AND OTOL., vol. iv.). In Bezold's specimen there seems to have been present, besides the enormous dilatation of the bulbus, also a dehiscence of the floor of the drum cavity, and the author points out the possibility that in such cases the wall of the vein might come in direct contact with the membrane of the fenestra rotunda, and thus immediately convey the blood murmur to the labyrinth. On page 40 we find a table containing the dimensions of the drum cavity, the aditus ad antrum, and the cellular spaces. The first part of the paper closes with a résumé of the relative positions of the middle ear cavities toward each other and the auditory meatus, and with a chapter on the remaining pneumatic spaces.

The second part, *which treats of the casts obtained from specimens deprived of their soft parts*, begins also with directions for making them. In the casts of the bones prepared in this way, the spongy spaces appear as delicate, moss-like tresses, from which the pneumatic spaces are easily distinguished by their size, rounded form, and darker color; the compact bone, of course, leaving nothing but lacunæ. In this way the distribution of the various kinds of bone-tissue can be accurately followed, and, in connection herewith, the author calls to mind that the occurrence of partly carious, partly necrotic, processes in the petrous bone is dependent on this anatomical relation. For instance, diseases of the mastoid process give rise to necrotic processes, besides caries, far more frequently than is generally assumed, because the pneumatic spaces of the mastoid process are surrounded by an envelope of compact bone. An osseous nucleus, which required for its solution the repeated employment of hydrochloric acid, was found by the author, in most specimens, in the solid angle of the semicircular canals, as well as in the depth behind the internal meatus. This result completely accords with the peculiar modification of the osseous tissue in the pyramid of the temporal bone, described by S. Moos and the Reviewer, in volume ix., of these ARCHIVES.

Next follows the description of the complete plastic cast of the interior of the bone, made after the removal of its soft parts by maceration. Of this part we only wish to point out the fact, that in none of the preparations were pneumatic cells found in the vertical portion of the squama above the temporal line; in the most anterior horizontal part of the squama, above and in front of the glenoid fossa; in the interior half of the auditory canal; in the immediate surroundings of the labyrinth; and, as a rule, in

the inner third of the pyramid ; of the cells of the mastoid part, those in the immediate neighborhood of the auditory canal, are the smallest and most strongly flattened ; the cells increase in size in the middle of the mastoid part, and attain their greatest dimensions all around its periphery. Where the fissura mastoideo-squamosa has been preserved, it appears in the cast as a thin leaf. The pneumatic cellular spaces of the pyramid, on an average, are smaller and flatter than those of the mastoid part. A table on page 60 gives the dimensions of the complex of cells in the plastic cast. We must refer to the original for a more exact study of these dimensions which are of importance, especially in reference to the position of the transverse sinus. As regards the functional importance of the pneumatic spaces of the temporal bone, the author expresses the opinion that their possible advantages are far exceeded by the disadvantages attributable to them as conductors of pathological processes. This is true, both of the purulent and of the catarrhal processes, because on occlusion of the tube, rarefaction of the air by absorption of its oxygen occurs not only in the middle ear, but also in all the pneumatic spaces which represent so large a surface, and thus congestion of the vessels of the mucous membrane is conveyed likewise to more distant regions. Bezold furthermore calls attention to the fact, that the largest pneumatic cells are situated at the periphery—that is, at the greatest distance from the central cavities of the middle ear—a condition extremely unfavorable for the escape of secretions, as well as for their absorption. Abscesses in the large pneumatic spaces at the lower surface of the mastoid process occasionally discharge their contents behind the muscles there inserted ; Bezold, as is well known, called attention to this possibility in another publication.

The last pages furnishes us the explanation of the casts of the infantile temporal bone, from the new-born to children three years old. The mastoid antrum is investigated with especial thoroughness as regards its form, size, and situation. Finally, in reference to the illustrations, which are reproduced from photographs of preparations in life-size, it is very much to be recommended to examine them through a strong lens. Thereby the finding of the minute details is not only greatly facilitated, but the forms, as it were, project plastically from the plane, and we cannot repress the idea that a stereoscopic photograph of such preparations must be of advantage for their study. We conclude with the wish that this thorough, and, in

anatomical and practical respects, equally valuable work, may find a large circle of readers.

Die acute Entzündung des häutigen Labyrinthes des Ohres (Otitis Labyrinthica S. Intima) irrthümlich für Meningitis cerebro-spinalis gehalten. Für practische Aerzte dargestellt von Prof. Dr. R. VOLTOLINI, in Breslau. Breslau : E. Morgenstern, 1882. Reviewed by Arthur Hartmann, Berlin.

In the present monograph Voltolini aims at proving that the disease first described by him as otitis labyrinthica is usually erroneously diagnosed as epidemic meningitis. Voltolini's demonstration, we shall premise, culminates in this, that the loss of hearing of 187 deaf-mutes who were brought to him was, in his opinion, caused by otitis labyrinthica, and that he believes that in these cases he can exclude an abortive form of cerebro-spinal meningitis. In order to prove the great importance of the disease, Voltolini cites from a report of the Breslau Institute the statement that about fifty per cent. of the inmates became deaf in consequence of cerebral affections. Voltolini's logic, then, is this: "If otitis labyrinthica furnishes to me, a practical otologist, a greater contingent than all other diseases, I can safely assert that otitis labyrinthica furnishes the largest contingent to the deaf-mute institutions, for the otologist sends these deaf-mutes to those institutions." The Breslau report comprises the years 1869 to 1878, a period in which, as Voltolini emphasizes, no epidemic of cerebro-spinal meningitis prevailed in any part of Germany. This, indeed, is correct. But Voltolini overlooks that it is just during the period mentioned that the children who had become deaf during the great epidemic of cerebro-spinal meningitis in the years 1863-1865 would be required to enter school. Especially because we know that in Breslau the children are sent to school later than elsewhere.

Voltolini believes that the proportion in the Berlin deaf-mute institute [the royal institution is meant—REV.] is similar to that of Breslau, because here likewise a very large number is reported as deaf in consequence of cerebral affections. As no cerebro-spinal meningitis prevailed, Voltolini puts the question: "What remarkable 'inflammation of the brain' could it have been that caused so many children to become deaf?" The Reviewer takes the liberty of replying that the "remarkable inflammation of the brain" was the simple non-epidemic basilar meningitis, which seems to be altogether unknown to Voltolini. It so happens that the Reviewer possesses accurate data in reference to the deaf-

mates in the royal institution at Berlin, and he can assert positively that at present there is not one among the pupils who has become deaf in consequence of otitis labyrinthica. Almost without exception, as we shall show more fully in the next number of these ARCHIVES, the diseases were grave and of long duration, and leave no room for doubt that they were meningitis.

Of the 187 cases which came under Voltolini's observation from various countries in the years from 1853 to 1881, thirty-six belong to the years 1863, 1864, 1865; forty to the years 1870, 1871; eighteen to the year 1879, while but few cases were observed in the remaining years. Voltolini says: "It would be an erroneous conclusion if one were to attempt to invalidate my deduction by saying that it appears from my above figures that (for instance, in 1879, when an epidemic of meningitis prevailed in Silesia or Breslau) many cases of the disease which I call otitis labyrinthica occurred at the same time (18); it would be an erroneous conclusion, for we learn, on the other hand, from the same table that in the years 1870 and 1871 twenty cases each—that is, even more than in 1879—came under my observation when no epidemic prevailed!" Here Voltolini is in error, for in the years 1870 and 1871 epidemics prevailed in various parts of Germany, especially here in Berlin ("Comp. Jahresberichte von Virchow and Hirsch für 1871," Bd. ii., p. 201). The period during which the greater number of cases came under observation coincides, therefore, so closely with the time of the epidemics, that Voltolini will probably not charge us with a lack of logic if we assert it appears from Voltolini's table that in a large number of his cases epidemic cerebro-spinal meningitis must have been present.

Voltolini subsequently groups together the symptoms by which his otitis labyrinthica is to be distinguished from cerebro-spinal meningitis leading to deafness. With regard to the most important characteristic of cerebro-spinal meningitis, Voltolini says: "Persistent dizziness and staggering gait are not prominently mentioned by any writer," while after otitis labyrinthica, staggering gait and vertigo remain without exception for months and even years. Here again Voltolini is in error, inasmuch as all writers who have treated at some length of the deafness occurring with cerebro-spinal meningitis, lay stress on the fact that vertigo and a staggering gait are associated with the deafness.

As Voltolini assumes that this symptom is so characteristic "that we can say at once, when seeing such a child: it has suffered from otitis labyrinthica some time ago," we might likewise assume that many of his diagnoses are based on this error.

That Voltolini is not over-scrupulous in his diagnoses, appears from the notes of the fifty-one cases cited. The first case reads literally: "1. Otto F., from Greissen, in Thuringia, almost absolutely deaf, had become so in 1856 by some affection of the head, that is, most probably by otitis labyrinthica; was examined by me in 1862, and the examination showed no other abnormality. I enumerate the case because it happened far away from Silesia." The statement that the child had become deaf by some disease of the head is sufficient for Voltolini to number it among his 187 cases of otitis labyrinthica. In several of the cases nothing is stated but that the child became deaf. In a larger number of the cases cited more in detail, dating from a later period, the symptoms are far more characteristic of meningitis than of otitis labyrinthica.

Voltolini finds a material support for his view in the fact that, in none of the cases observed by him, other nervous regions were affected. The Reviewer cannot regard this as positive evidence, for, in the large majority of persons deaf from meningitis, who come under observation in deaf-mute institutions, an affection of other nervous regions is not met with.

Voltolini believes that otitis labyrinthica cannot be confounded with sporadic meningitis, because the latter, according to Niemeyer, as a rule is confined to the convexity. Here, too, Voltolini is in error, inasmuch as the acute form of sporadic basilar meningitis occurs both in adults and in children. In this respect we refer to a more competent authority, Huguenin (*Ziemssen's Cyclopædia*, "Diseases of the Nervous System," first half).

A great deal more might be said about Voltolini's book. The Reviewer, however, believes he can confine himself to some of the main points. Although the occurrence of otitis labyrinthica in Voltolini's sense is not to be disputed, especially since Politzer confirmed its occurrence by a post-mortem examination, attention must nevertheless be called to the fact that the foundations of Voltolini's views are largely based on error. By the book under review, with its errors corrected, as well as by the experience of all other observers, the conviction is forced upon us that the disease occurs by no means with the frequency which Voltolini seeks to demonstrate.

Student's Manual of Diseases of the Nose and Throat.

By J. M. W. KITCHEN, M.D., G. P. Putnam's Sons 1883.
Price \$1.00

A very handy, beautifully printed compendium of 124 duodec-

imo pages, with numerous engravings. It may serve to the beginner as an introduction—first steps—in a very important branch of the healing art. It begins with an (incomplete) anatomical résumé, describes and depicts on ten pages the instruments for diagnosis and treatment, on eight pages the principal remedies, on seventeen pages the “manipulative methods” of examination, local application of remedies, and operations, on forty pages the common disorders of the nasal fossæ and pharynx. The remainder is devoted to the diseases of the larynx. The book, though short, presents the subject in a comprehensive and attractive manner, and contains, even for the adept, many a useful hint. H. K.

Guide to the Study of Ear Disease. By P. McBRIDE, M.D., (Edinburgh) : W. & A. K. Johnston, Edinburgh, 1884.

We just receive this new treatise of 198 octavo pages with seven colored and three lithographic plates. We regret that the closing of the present number of the ARCHIVES has not left us time to read the book carefully enough to form a competent opinion, but we will not delay calling the attention of our readers to this very neatly gotten up volume the usefulness of which is guaranteed by the well-known name of the author. The arrangement of the first two-thirds of the book, does not deviate materially from that of other text-books. In the last third some special subjects are described with more than ordinary detail, viz.: the disturbance of the nervous system resulting from ear disease, *e. g.* anomalies of taste, epilepsy, vertigo, etc. Tinnitus aurium is very fully discussed. Particularly important appears the last chapter : Diseases which effect the ear :—scarlatina, mumps, typhoid, cerebro-spinal meningitis, malaria, syphilis, locomotor ataxia, and many others. H. K.

MISCELLANEOUS NOTES.

The eighth session of the INTERNATIONAL MEDICAL CONGRESS will be held at Copenhagen, from August 10 to 16, 1884. Dr. V. Meyer is the president of the organizing committee for the section of otology, Dr. V. Bremer the secretary.

The meeting of the BRITISH MEDICAL ASSOCIATION will be held at Belfast, Ireland, from July 29 to August 1, 1884. There will be a sub-section on otology.

The THIRD INTERNATIONAL OTOLOGICAL CONGRESS will be held at Basel, Switzerland, from Sept. 1 to 4, 1884. Organization Committee : Drs. Burckhardt-Merian, (President) ; Hartmann, Löwenberg, Ménière, Politzer, Sapolini, Dalby, Pritchard, Blake, and Roosa.

The meeting of the AMERICAN OTOLOGICAL SOCIETY will be held at the Kaaterskill House, Catskill Mountains, July 15, 1884. President : Dr. C. H. Burnett.

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NOTICE TO CONTRIBUTORS.

THE editors and publishers of the ARCHIVES beg to offer some suggestions to authors who propose to favor them with their contributions.

1. As original communications the ARCHIVES can accept only such papers as have neither been printed nor are intended to be printed in other journals. If a preliminary communication on the subject of a paper has been published, the author is requested to state this in the letter accompanying his manuscript. It is understood that contributors to these ARCHIVES and editors of other periodicals, will make no abstracts of the original papers published in this journal without giving it due credit for the same.

2. Authors will receive gratuitously twenty-five reprints of their articles. If a greater number is desired,—notice of which should be given at the head of the manuscript,—only the additional cost of presswork and paper will be charged to the author.

3. In preparing manuscript for the compositor it is requested that the following rules be adhered to :

a Write on one side of the paper only.

b. Write without breaks, *i. e.* do not begin a new sentence on a new line. When you want to begin a new line or paragraph at a given word, place before it in your MS. the sign ¶.

c. Draw a line along the margin of such paragraphs as should be printed in smaller type, for instance, all that is clinical history in reports of cases, etc.

d. Words to be printed in *italics*, should be underscored once, in SMALL CAPITALS twice, in LARGE CAPITALS three times.

4. Authors may receive proofs for revision if they will kindly return them without delay. We beg however to remind our contributors that changes in the copy are equivalent to resetting, causing so much additional expense. We therefore request them, to make, if possible, no alterations at all in their MSS., or, at least, to limit these to what is of essential importance.

ARCHIVES OF OTOTOLOGY.

THE TEMPERATURE OF THE EXTERNAL AUDITORY CANAL.

By A. EITELBERG,

AURAL SURGEON AT THE GENERAL POLIKLINIK, IN VIENNA.

Translated by EDWARD FRIDENBERG, M.D.

THE temperature of the external auditory canal has been repeatedly studied by various authors. The necessary experiments were not, however, always conducted from the same point of view. In some cases the investigation was purely physiological, in others devoted to the determination of the conditions governing heat-production in the cranial cavity during cerebral disease; in others, finally, the influence of certain drugs on the blood-vessels of the brain was to be elucidated. We shall only refer to such experiments as have a direct bearing on the subject under consideration.

According to J. van der Becke Callenfels,¹ who experimented with rabbits, the temperature of the ears rises and falls rapidly with a corresponding change in the temperature of the surrounding atmosphere; the temperature of the ears is influenced by variations in the temperature of the internal organs; and diminished blood supply to one ear causes a rise of temperature in the other. "After section of the sympathetic nerve on one side, we have increased supply of blood, and hence a rise of temperature in the ear of the same side, and simultaneously the temperature falls in the ear of the opposite side. If we now cut the second sympathetic nerve, the temperature of the colder ear rises, and simultaneously the temperature of the ear originally warmer falls."

¹ Henle's *Zeitschrift f. rationelle Medicin*, neue Folge, vol. vii., 1855, pag. 173, *seq.*

Albers¹ examined the temperature of a large number of insane people, and found differences of one or even of several degrees in the temperature of the temples, the ear, the neck, and the hand.

According to Ludwig Meyer² the physiological temperature of the rectum and of the temporal fossa never varies more than 0.1° ; in certain phases of progressive paralysis, however, the temperature of the temporal fossa exceeds that of the rectum by 0.3° .

According to Mendel³ hypnotic doses of chloral depress the temperature of the external auditory canal considerably, without influencing the internal temperature, as measured in the rectum. Morphine has the specific effect of reducing the temperature of the external canal, which Mendel believes to be due to an isolated irritation of the vaso-motor nerves supplying the carotid system.

Weber Liel,⁴ who is the only one thus far, I believe, who has studied the temperature of the external auditory canal in aural diseases, states that in malarial neuralgia affecting any branch of the nerve supply of the ear the paroxysms are accompanied by a rise in temperature in the external auditory canal to 39° , the temperature in the axilla remaining at 37° .

I have measured the temperature of the external ear in a large number of cases of aural disease (over fifty), and measured the temperature repeatedly in each case. The result thus obtained will be given in the following pages.

At first I used a small clinical thermometer, which I was obliged to abandon, however, as it caused pain, and was never tolerated more than five minutes at a time. Since then I have made exclusive use of the aural thermometer designed by Urbantschitsch and manufactured by H. Kappeller of Vienna. This thermometer is composed of three horizontal pieces meeting at right angles, and a vertical piece, which is graduated ($33-45^{\circ}$ C.). The reservoir is 15 mm. long, and cylindric in shape, and is contained in the

¹ *Zeitschrift f. Psychiatrie*, vol. xviii., pag. 45, seq.

² *Annalen d. Charité Krankenhaus*, vol. vii., 2, 1858, pag. 171, seq.

³ *Virchow's Arch.*, vol. lxii., 1875, pag. 132, seq.

⁴ *Monatsschrift f. O.*, vol. xii., 1878, No. 5.

end of the horizontal piece, which is introduced into the ear. Separate thermometers are needed for the right and the left ears, the temperature being taken in both ears simultaneously. These thermometers are held in place in the ears by two clamps attached to a head-band by ball-and-socket joints.

These thermometers create only slight irritation, if properly fastened; they are, however, irksome to the patient, as he is obliged to refrain from moving his head or speaking. Movements of the head and of the lower jaw necessarily cause pain.

The outer end of the reservoir is surrounded by a close-fitting rubber tube for the purpose of closing the external canal against the surrounding atmosphere; in addition to this the spaces between the thermometer and the walls of the auditory canal are packed with cotton, and, in order to make the closure as perfect as possible, the external layer of cotton is coated with some fatty substance.

Both aural thermometers, as well as the clinical thermometer, with which I take the temperature in the axilla, were compared with the standard thermometer by Mr. Kappeller, and the necessary corrections noted. The aural thermometers were introduced into the auditory canal to the depth of 18 *mm.*, *i. e.*, to the bony portion of the canal, in which, as my experiments prove, the temperature is higher by several tenths of a degree than it is in the cartilaginous portion. When pushed further inward, the aural thermometer causes severe pain. All three instruments were kept in place the same length of time, usually half an hour, occasionally an hour.

The influence of the lower temperature of the surrounding atmosphere on the temperature of the external auditory canal was studied during the winter on patients who had been seated in a cold room for thirty minutes or longer. In some of these cases, particularly in the anæmic, the temperature sank to 36°, while in the robust it was found to be 37° or even higher.

Callenfels (*l. c.*) experimented in the same direction on rabbits. Cooling of the atmosphere after a series of hot

days caused pallor of the ears and a reduction of the temperature in the ears, so that it exceeded the temperature of the atmosphere by $1-5^{\circ}$ only. As the temperature of the ears, according to Callenfels, is regulated by internal causes, and not by local influences, we would not expect the temperature of the ears in man to sink much below the normal, even when exposed to cold air for a long time.

The temperature of the ears bears no constant ratio to the temperature of the body. Frequently no difference between the two is observed; in the majority of cases, however, the temperature of the axilla is higher than that of the external auditory canal by $0.1-0.3^{\circ}$. The same results were reached by Mendel (*l. c.*), with this difference: he measured the temperature of the body in the rectum, while I could use only the axilla for this purpose. In the chronic insane, this author often found the normal difference; in some cases an increase in this difference to 0.6° , or a decrease to 0.05° . There was no constancy or regularity about these variations.

Both in my experiments and in those of Mendel, the maximum height of the mercurial column was attained in about ten minutes. The circumstances which caused exceptions to this rule will be explained further on.

In the two ears we may find the same temperature within a few hundredths of a degree, or differences of $0.1-0.3^{\circ}$. No rule could be deduced from these variations.

It is not evident whether the above-mentioned authors measured the temperature of both ears; and particularly whether they measured it in both ears simultaneously.

Broca,¹ however, used a "Crown of Thermometers," consisting of six thermometers, contained in cases, lined with cotton. This was applied to the skull from twenty to thirty minutes in such a manner that one thermometer rested on the external orbital margin, one on the occiput, and one at the height of the ear symmetrically on either side. His conclusions read as follows: The physiological temperature of the left side is higher by 0.1° C. than that of the right side. The physiological temperature of

¹ *Centralblatt, f. d. medic. Wissenschaften*, 1878, page 31.

the vertex is higher by 0.1°C . than that of the frontal or of the occipital region. Mental activity increased the temperature of the right side of the brain more than that of the left. In embolic processes affecting one side of the brain the temperature of the temples is lowered, while the temperature of the forehead and of the occiput is increased on the side affected.

Broca applied his thermometer at the *height* of and not to the interior of the external auditory canal, a fact to be borne in mind since my experiments show the temperature of the deeper portion of the external auditory canal to be higher than that of the peripheral portion (*v. s.*).

My experiments did not enable me to determine positively which side, as a rule, has the higher temperature. The higher temperature is found as often on the right as on the left side in different individuals, and might even vary in the same individual if the temperature be taken at different times.

For instance: John M., aged fifty-nine, suffers from loss of hearing and constant tinnitus aurium. On both sides drum-head sunken and thickened.

April 11, 1883: right ear 36.6° ; left ear 36.9°C .

May 9, 1883: " 36.8° ; " 36.6°C .

" 28, 1883: " 36.9° ; " 36.7°C .

June 7, 1883: " 37.3° ; " 37.2°C .

As a rule the temperature of the external auditory canal varied between 36.8° and 37.4° , these limits being exceeded to a marked degree in a few cases only. Increased temperatures in the external auditory canal were not found in any case without a similarly increased temperature of the body.

In only one of my cases was the temperature of the diseased ear higher than that of the axilla. The case was one of tympanitis phlegm. on the right side.

Anna R., æt. twenty-five, right ear, tymph. phlegm.; left ear, normal. May 23d: right ear, 37.4° ; left ear, 36.8° ; right axilla 37.1°C . May 26th: inflammation subsiding; right ear 37.1° ; left ear 36.7° ; right axilla 37.2°C .

This condition may, however, obtain in other diseases of the ear, as Weber Liel (*l. c.*) found the temperature of the

affected ear 2° higher than the temperature of the axilla in cases of malarial neuralgia of the ear. I had no opportunity of examining such cases.

A marked increase of temperature in the diseased ear, as compared with the other, apparently normal ear, sometimes reaching 0.6° , was several times seen in unilateral phlegmonous inflammation. It was furthermore found in acute purulent inflammation of the middle ear and in the chronic form of tympanitis purulenta, characterized by marked vascularization of the mucous membrane and injection of the remnants of the drum-head. The formation of polypi had no apparent effect on the temperature.

The following is an example of *timp. pur. acuta*:

Josephine Ph., æt. thirty-one. Right ear: tympanitis pur., with great pain since ten days.

April 10th.—Right ear, 37.7° ; left ear, 37.1° ; right axilla, 37.9°C .

April 12th.—Right ear, 37.6° ; left ear, 37.1° ; right axilla, 37.6°C .

April 19th.—Timp. pur. cured; right ear, 37.7° ; left ear, 37.7° ; right axilla, 37.9°C .

May 2d.—Right ear, 37.5° ; left ear, 37.3° ; right axilla, 37.8°C .

In tympanic affections of a less active character the temperature was the same or nearly the same, as a rule, in the two ears, and the relation between the temperatures of the ear and the axilla was normal. But in those cases in which the temperature was considerably higher on the affected side than on the normal side, it did not exceed the temperature of the body at all or only by a trifle; the temperature of the normal ear, however, was often markedly lower than that of the body. I do not know whether this phenomenon is to be explained by the law of Callenfels (*vide supra*), that increased blood supply to one ear causes a fall of temperature in the other, but would emphasize the fact, that there is no absolute rise of temperature in the abstract at the point of inflammation, *i. e.* in the diseased ear. The temperature was only relatively higher in the ear affected, as compared with the healthy ear; but compared

with the temperature of the axilla, it was within the normal range.

In otitis externa circ., where the pathological condition would almost seem to postulate a rise of temperature, no increase of temperature was observed in the diseased ear as compared with the unaffected ear or the axilla. The maximum height of the mercurial column was, however, reached earlier on the affected side than on the healthy side.

The following case shows the condition of the temperature in otitis externa circ. It furthermore proves, that febrile temperature of the body is always accompanied by febrile temperature in the ext. auditory canal, even when both ears are free from inflammation.

Josephine P., æt. sixteen, right ear : otit. extern. circ. since three days.

May 22d.—Right ear, 37.3° ; left ear, 37.4° C.

May 25th.—Otit. ext. circ. cured. Two days ago patient caught cold ; yesterday she was obliged to keep her bed ; to-day she is still indisposed. Right ear, 38.3° ; left ear, 38.2° ; left axilla, 38.4° C.

June 2d.—Three furuncles in left ext. audit. canal. Right ear, 37.6° ; left ear, 37.6° ; right axilla, 38.4° C.

I may here also mention the fact that the temperature not only of the two ears, but also that of the mastoid antrum and of the internal canal, is sometimes the same. This occurred in a case, which I have more fully described in a paper entitled : Cases of Periostitis and Caries of the Mastoid Process,¹ and in which both mastoid processes were the seat of large fistulæ leading into the mastoid antrum. An aural thermometer was introduced into the largest fistula in the left mastoid process, with all the precautions detailed above ; another thermometer was introduced into the right ext. audit. canal. They both registered 36.9° C., *i. e.* the temperature was the same in the right ext. audit. canal and in the left mastoid antrum.

The influence of the hypnotic state on the temperature of the ear was studied in the case of a girl, aged twenty-

¹ *Wiener med. Presse*, 1882, No. 46-50.

two, who was suffering from chronic inflammation of the tympanum. This patient would go into a trance on looking attentively at any bright article, or on looking into a common mirror for more than two or three minutes at a time, and was easily awakened by a breath of air blown into her face. During the trance the sensibility was diminished to such an extent, that a needle pushed through a fold of skin on the back of the hand or on the arm gave rise to no reaction on the part of the patient; the facial expression was one of deep sleep, the respiratory movements being reduced in frequency. On awaking the face became flushed, and the patient was somewhat excited, but she regained her previous equanimity after walking a few minutes in the open air. The most careful observation of the mercurial column before and during the hypnotic state, which was allowed to last five minutes in the first experiment, and ten minutes in the second experiment, made a few days later, showed absolutely no change in the temperature.

Massage of the ear¹ and inflation of the middle ear had no effect on the aural temperature.

Removal of polypi was occasionally followed by an immediate fall in the temperature. After a certain time the temperature commenced to rise, reaching a point higher than that registered before the operation. The measurements made under these circumstances were, however, not sufficiently uniform to enable me to draw any conclusions from them. The initial fall and subsequent rise of the temperature may perhaps be explained by assuming that the vaso-constrictors were irritated by the snare used in the operation, the irritation causing at first a contraction of the vessels and a diminution of the blood supply, and subsequently with the reaction a dilatation of the vessels and a rise of temperature. The initial fall may also have been due in part to the loss of blood incidental to the operation. The interval between the fall and the rise of temperature varied. But an identical fluctuation in the temperature was frequently observed in the other ear, which had not been subjected to any kind of manipulation.

¹ *Wiener medic. Presse*, 1883, Nos. 26-30.

Similar changes in the temperature were observed after paracentesis of the drum-head in cases of acute suppurative tympanitis. Temporary fluctuations were also caused by syringing the diseased ear, but they were limited almost always to the ear treated. We thus see that the rule, according to which an increase of temperature in one ear causes a reduction of temperature in the other, does not apply to these cases. The temperature of the water used in syringing is not, moreover, without influence on the result of the measurements, as will be shown further on.

The effect of the application of cold to the anterior and the lateral surfaces of the neck, on the temperature of the external auditory canal, has been studied by Wilhelm Winternitz.¹ This author considers the temperature of the external auditory canal to be the most sensitive measure of the temperature, and hence the circulation, of the head. "I regard," he says, "the temperature in the external auditory canal as a more sensitive test than the ophthalmoscopic examination; for slight changes in the calibre of the retinal vessels can be overlooked more easily than a change in the height of the mercurial column. The elasticity of the ocular tunics, and the positive intra-ocular pressure may, moreover, prevent many disturbances in the circulation of the head from manifesting themselves in the eye, while they will still be revealed by fluctuations in the aural temperature."

Winternitz applied cold cloths, changing them every minute. After thirty minutes the temperature had fallen 0.25° . Forty minutes after the discontinuance of the application the temperature was found to have risen 0.2° , but had not yet reached its original height.

Weber Liel proved by means of the aural thermometer that the application of cold in acute aural diseases² has a rapid and marked antiphlogistic action, and recommends this therapeutic measure highly. He says: "I have made the experiment repeatedly as follows: The aural thermometer was introduced and retained in the external auditory

¹ *Die Hydro-therapie*, 1877, pages 76 and 77.

² *Monatsschrift f. O.*, Bd. xv., 1878, No. 1.

canal of the inflamed ear twenty to thirty minutes, and the temperature recorded; in acute inflammations it varied between the periods of exacerbation between 37.5° and 38.5° . Cold cloths were now applied constantly from half an hour to an hour. The temperature was then found to have fallen five to eight tenths of a degree C."

My experiments on this point were made as follows: A thermometer was placed in each ear, and when the mercurial column had become steady the thermometer was taken out of one ear and water at 26° C. was injected repeatedly. The temperature fell very slowly and remained for some time 1° below its previous height. In other experiments water at 40° C. was used, when the temperature rose very rapidly, exceeding its previous height by some tenths of a degree. In both series of experiments all effect was lost after thirty minutes, the lower and the higher temperature returning to the height registered before the injection. The temperature of the other ear remained unchanged or sank in a few cases about 0.1° .

It is evident from the experiments above detailed that very few facts concerning the temperature of diseased ears have as yet been ascertained, and that these cannot be formulated into laws generally applicable. This becomes the more apparent the greater the number of thermometrical examinations made in the different forms of disease. With the exception of a few general laws, in which the margin for accidental variation is, however, exceedingly ample, the statements of authors as to the temperature in diseased or inflamed parts vary considerably. While some have found the temperature of inflammatory foci higher than that of the body, others have never seen the temperature of inflamed organs higher, but occasionally lower, than that of the body. Billroth¹ measured the temperature of forty-eight wounds, and found it higher at the point of inflammation than in the rectum in two cases only. Jacobson and Bernhardt² found the temperature of the inflamed pleura and of the inflamed peritoneum to be below that of the heart by several tenths

¹ *Archiv f. Klinische Chirurgie*, 1865, vol. vi., p. 381.

² *Centralblatt f. d. medic. Wissenschaften*, 1869, p. 290.

of a degree in every case. Their conclusions read as follows: "Without a single exception the temperature of the inflamed part was seen in our experiments to be lower than the temperature of the heart, and we therefore believe the idea, prevalent in modern pathology, that inflamed tissue is the seat of increased oxidation, and therefore of increased temperature, to be erroneous, and that John Hunter's dictum: Local inflammation does not increase the temperature of any part, beyond the temperature of the organs of circulation, is correct."

A large series of carefully conducted experiments and improved methods of examination will be required to disclose all the facts bearing on the temperature in disease generally, and in disease of the ear in particular.

TWO RARE CASES OF MECHANICAL INJURY TO THE ORGAN OF HEARING.

BY S. MOOS, IN HEIDELBERG.

Translated by CHARLES J. KIPP.

CASE I.—BILATERAL LABYRINTHINE DISEASE WHICH WAS DEVELOPED FIFTEEN MINUTES AFTER A STAY OF THIRTY HOURS' DURATION IN A DIVING APPARATUS. A CONTRIBUTION TO THE PATHOLOGICAL EFFECT OF COMPRESSED AIR.

IN his observations on the behaviour of the organ of hearing in compressed air, Magnus¹ has among other things pointed out the injurious effect of such air upon this organ; he has shown that the air pressing into the external canal is the cause of the pain; that the degree of the pain itself varies in different individuals, and that, while the pain lasts, the membrana tympani is actually pressed inward by greatly compressed air. Serious lesions of the organ of hearing were not observed by Magnus himself. He mentions, however, that Francois, who made his observations during the building of the bridge at Cologne, speaks of hemorrhage from the ear.

Magnus's observations were made at a depth of from thirty to forty feet, and under an atmospheric pressure of from two to two and a half atmospheres.

My observations were made on a man twenty-six years of age who had worked, with but short interruptions, for thirty-six hours under a pneumatic air pressure equal to nine meter water pressure, and had suddenly left the equal-

¹*Archiv f. Ohrenheilk.*, Bd. i., p. 269.

izing chamber, on the call for help from a fellow-workman, and had then gone to an inn where he ate and drank.

About a quarter of an hour after leaving the chamber—on the 23d of September, 1882—he felt giddy and sick; later, he also vomited. On the same day he was put under the care of Dr. Rembe, in Ludwigshafen, whose report is as follows :

“The patient has been under my treatment since the 23d of September, 1882. In the beginning he complained of severe vertigo which made it impossible for him to walk ; of hardness of hearing, and tinnitus aurium. The patient attributed his illness to working too long under increased atmospheric pressure. The examination made at that time showed almost absolute deafness of the left ear and great impairment of hearing of the right ear. The drum membranes were somewhat sunken, but there was neither perforation nor hemorrhage. The patient was at that time unable to stand erect without support, and reeled about like a drunken man. While in the recumbent position the vertigo was diminished, but the roaring in his ears prevented his sleeping soundly.

“The treatment consisted at first in absolute rest, spare diet, laxatives, and the bromide of potassium. The air douche which was carefully used a few times for diagnostic purposes increased the vertigo but did not improve the hearing. In the course of the following weeks there was some improvement as regards the vertigo, and perhaps also in hearing. He was now given the iodide of potassium alternately with the syrup of the iodide of iron, and tincture of iodine was applied to the mastoid process.”

On the 15th of March, 1883, the patient's condition was as follows : He is pale and looks as if he was suffering ; he still walks with his legs spread apart ; complains of giddiness, noises in the ear, and sensitiveness of head.

Examination showed the right drum membrane normal ; in the left there is a small atrophic spot (scar ?) in front of the handles of the malleus. Bone conduction for the watch is absent. The C tuning-fork is felt but not heard, and causes pain in head.

C¹ is neither felt nor heard.

A¹ the same.

No tuning-fork held in air is heard. Speech is not at all

understood by the left ear, and by the right only on shouting directly in the ear.

Diagnosis : hemorrhage in both labyrinths.

Treatment : salt-water baths in Dürkeim for four weeks.

June 5th.—The patient's employer, who was willing, as he stated in his letter of March 7, 1883, to defray the expenses attending a sojourn of four weeks' duration in Heidelberg, declined to pay the cost of the baths in Dürtheim, and as the patient himself is without means, nothing has been done since in the way of treatment. He now hears loud speech somewhat better with the right ear. The left ear is totally deaf. The C tuning-fork still causes a disagreeable, painful feeling ; C' only a humming ; A¹ placed between the teeth produces a sensation. Treatment : thirty baths of kitchen-salt and Kreuznach mother-lye, at a temperature of 27° R., the patient to remain thirty minutes in the bath.

July 27th.—Speech is understood better in the right ear, but not at all in the left. The patient walks better. The patellar reflex is normal on both sides. Patient complains chiefly of the noises in the head. Treatment : ferr. iod. five grammes, to be made into one hundred pills.

August 7th.—Patient walks better and looks better. He suffers from constipation, and the dose of the iodide of iron is therefore reduced, and an occasional dose of castor oil ordered. After taking all the pills of iodide of iron prescribed, he is to take none for two weeks. The examination showed no change in the right drum membrane. The left was hyperæmic, and showed increased lustre.

October 16th.—The functional examination gives the same results as at last visit. Is still constipated. Treatment : laxative pills.

The patient now instituted a suit for damages against his employer, and I was ordered by the district-court in Frankenthal to give my opinion as an expert as to the condition of the plaintiff, " who, in consequence of the accident, was confined to his bed and under medical treatment for six weeks, was unable to walk, and suffered from headache, noises in the ears, and intense vertigo ; who, in consequence thereof, was entirely incapacitated for work till the beginning of May of this year ; who is still, and will be prob-

ably always unable to do more than a very limited amount of work, as he is unable to stoop ; who cannot endure being in the sun or in a noisy workshop, and is still under medical treatment ; and whether the illness resulted from the plaintiff's working too long, under too high atmospheric pressure, for the defendant." The case did not, however, come to trial, as a settlement was effected but a few days before the meeting of the court.

REMARKS.

There can be no question that this suddenly developed ear disease, which manifested itself by nearly total deafness of both ears, tinnitus aurium, and vertigo, followed by staggering gait and inability to stand without support, was caused by his leaving suddenly the diving apparatus, after working in it under an atmospheric pressure of two atmospheres, with but short intermissions, for thirty hours. These symptoms were probably the result of a hemorrhage in the labyrinth. The following appears to be the most plausible explanation of its genesis.

During his long stay in the strongly compressed air the tension within his blood-vessels was also greatly increased. With the blood pressure thus increased he left the diving bell, and, as a consequence of the too great difference in the tension within and without the blood-vessels during the first fifteen minutes after leaving the diving apparatus, a rupture of blood-vessels occurred in both labyrinths. But why this should have taken place only here, I am unable to explain.

I should therefore have had no difficulty in answering the question put to me by the court, whether the defendant made the plaintiff work for too long a period under too high atmospheric pressure ; and as little in replying to the query, whether the complete disability to do work at first, and the partial incapacity for work subsequently, was caused by the accident. If the case had come to trial, the decision of the judge would probably have depended on the circumstance, whether the plaintiff had been warned of the danger to which he exposed himself by leaving suddenly the diving apparatus, and if so, whether the plaintiff had disregarded this warning.

During the last four years, cases of disease of the spine resulting from the sudden diminution of the atmospheric pressure have been reported by Leyden¹ and F. Schultze,² and the conditions found at the autopsy in these cases induce me to discuss the subject somewhat more fully.

Leyden reports on the accidents which occurred to the workmen engaged in building the Liteiny Bridge in Russia. Working under high atmospheric pressure these men suffered from many different complaints, the most frequent of which were pain in the ears on entering and leaving, and pain in the joints after leaving the chamber. Besides these, the attending physician (Dr. Lehwiss) had under his observation three cases of paraplegia, of which two with well-marked paralysis completely recovered in the course of a few weeks, while the other died on the fifteenth day of the disease. Leyden, who made the autopsy, found, on macroscopic examination no discoloration or residues of hemorrhages in the spinal cord. With the microscope he found, however, a spotted appearance in the thoracic portion, light yellow points being here sprinkled on the dark background. These foci consisted of heaps of large cells, and seemed to be sprinkled into the substance of the posterior columns. They were lying in the fissures in the torn nervous tissue. The round cells were of the size of granular corpuscles, and were lying loose by the side of each other in the crevices. There were no remnants of nerve fibres and neuroglia, *no remains of blood*, and *no shoals of pigment*. It is thus seen that small rents existed in the substance of the spinal marrow, but there is no evidence that these fissures were caused by extravasations of blood. According to Leyden, much rather is the assumption justified that they were caused by gas (O and CO^2) given off by the smallest blood-vessels or directly by the plasma when the barometric pressure was suddenly lowered.

¹ E. Leyden : On affection of the spine caused by a sudden decrease in the barometric pressure. *Arch. f. Psych.*, Bd. ix., page 316.

² F. Schultze : Contribution to the pathology and pathological anatomy of the nervous system. A contribution to our knowledge of spinal affections resulting from a sudden diminution of the atmospheric pressure, etc. *Virchow's Archiv*, Bd. lxxix., p. 124.

Schultze's case relates to an Italian workman, eighteen years old, who, while engaged in excavating a well, remained frequently for six hours in the caisson, under a pressure of from one to three and two tenths atmospheres. After leaving the caisson one day both ankle-joints became painful, and twenty minutes later the lower extremities were completely paralyzed. There was also paralysis of the bladder and rectum, and diminished sensibility as far up as the navel. Gangrene, etc., caused death ten weeks later. The macroscopic examination failed to discover any thing abnormal in the spinal cord. The condition known as "*leucomyelitis disseminata dorsalis*" was revealed by the microscope. In the lower part of the lumbar enlargement, the anterior portion of the lateral columns on both sides had undergone typical degeneration. In the cervical portion was found ascending degeneration of Goll's bundles and of the middle of the peripheric portion of the lateral columns. In the parts which had undergone the greatest change, the nervous elements had entirely disappeared, and in their stead were seen finely granulated cells. The vessels were of abnormal thickness. No extravasation, no blood-pigment or hæmatoidin could be found anywhere here, the same as in Leyden's case. Yet Schultze doubts that the gases given off from the vessels could have caused the injury to the spinal marrow, as the suddenly diminished atmospheric pressure would also have set free gas bubbles in the larger vessels, especially in the lungs, and thus have given rise to a dyspnotic condition, of which, however, no mention is made in either case. Finally, Schultze points out as remarkable, the absence of changes in the gray substance, which is so rich in capillaries, and says that the cause of the alterations found is not yet fully known.

Notwithstanding this absence of hemorrhages and their derivatives, pigment, &c., in the spinal cord of both the above cases, the supposition, that in my case a hemorrhage occurred in both labyrinths, need not be rejected absolutely, since it is well known that in *aëronauts*, when they have very rapidly ascended to high regions, regions in which a much lower pressure prevails, very often hemorrhage occurs

from the mucous membrane of the nose, the eyes, and other parts. The hypothesis that this injury to the nervous apparatus of the labyrinth was caused by gas which escaped from the vessels, seems, at least in my case, to be somewhat strained.

An attempt to explain this disturbance of function by a suddenly developed cerebellar disease could only end in failure.

Disturbed co-ordination, manifested by a staggering gait and intense vertigo, especially if accompanied with vomiting, points undoubtedly to disease of the cerebellum, and more particularly to an affection of the vermiform process, but other positive signs were wanting in our case. The whole course of the disease, moreover, contradicts this theory.

Results of Physiological Experiments Relative to Influence of Increased and Diminished Atmospheric Pressure upon Man and the Lower Animals:

For the sake of completeness, I shall state here briefly the results obtained, although I have been able to read in the original only the most recent of the papers on this subject, the ones by Lazarus and Schirmunski.

In opposition to Panum, Paul Bert, in his work "La Pression Barométrique," states that the arterial blood tension is in compressed air considerably increased by the mechanical effect of the pressure. H. Jacobson and Lazarus¹ were able to confirm Bert's proposition from experiments on lower animals. In the majority of their observations, there was an unmistakable increase in aortic tension, which outlasted the phase of the constant, and sometimes also that of the decreasing, air condensation. But while Bert observed an ascent of $\frac{1}{3}$ of the original height, H. and L. saw an increase of only $\frac{1}{12}$ to $\frac{1}{8}$ of the original value.

In a recently published paper by Lazarus and Schirmunski,² I find mention made of the fact that Fränkel and

¹ *Med. Centralblatt*, 1879, No. 51: "Über den Einfluss des Aufenthaltes in comprimirter Luft auf den Blutdruck."

² "Über die Wirkung des Aufenthaltes in verdünnter Luft auf den Blutdruck." *Zeitschrift f. klin. Med.*, von Frerich and Leyden, Bd. vii., Heft 3, pp. 299-314.

Geppert in a monograph, "Über die Wirkung der verdünnten Luft auf den Organismus," based upon a series of experimental observations, concur in Bert's conclusions.

Lazarus and Schirmunski experimented with Basch's sphygmomanometer. The sessions in the pneumatic cabinet lasted one hour. During the first twenty minutes the atmospheric pressure was gradually reduced $3\frac{1}{2}$ atmospheres = 380 *mm.* barometric scale; during the next twenty minutes the pressure was kept at this point, and during the last twenty minutes it was gradually increased again up to the ordinary atmospheric pressure.

From an examination of the charts, it appears that a decrease of $\frac{1}{2}$ atmosphere causes the blood tension to sink from 28 to 30 *mm.* mercury. This sinking of the blood tension does not, it is true, keep pace with the fall in the atmospheric pressure, but it certainly occurs under its influence, inasmuch as it not only continues, and even constantly increases, during the whole time the pressure is diminished, but always rises again simultaneously with an increase of atmospheric pressure, without, however, returning to the height present at the beginning of the experiment.

From the results obtained by the experiments on six persons, the authors draw the conclusion that the distribution of the blood is impaired at the least, as all of the persons suffered from dyspnœa, weakness, and distinct cyanosis during the period of greatest attenuation of the air.

From tracings obtained at the same time with Marey's sphygmograph, it appears that the pulse was increased in frequency and was dicrotic, a condition which, according to Marey, Landois, and Rollet, is often associated with diminished arterial tension, and which is connected with the diminished vital capacity in airless space, discovered by Schirmunski in 1877.¹

Recapitulation.—The effect of a stay in attenuated air on the blood tension is shown by a marked tendency in the curve, from the very beginning, to sink in the manner already described. This sinking outlasts more or less the period of

¹"Über den Einfluss der verdünnten Luft," etc.—Inaug. Dissertation, 1877.

constant attenuation, and ceases usually at the close of the experiment. Practical result: patients with heart disease should not be sent to high altitudes.

CASE 2.—RUPTURE OF BOTH DRUM MEMBRANES FROM THE COMPRESSION OF AIR, PRODUCED BY THE EXPLOSION OF CHLORPHTHALIC ETHER DURING THE MAKING OF EOSIN.

H., æt. thirty-four, a chemist engaged in the manufacture of eosin, was grinding chlorphthalic acid in alcohol, three weeks ago, when suddenly a loud detonation occurred, in consequence, as he thinks, of the explosion of nascent chlorphthalic ether, a part of which entered both eyes. He was stunned for a short time by the compression of the air, produced by the explosion; a keratitis developed in both eyes, and roaring in his head and hardness of hearing—at first chiefly in the left ear—followed. On the fourth day he noticed a discharge of a chocolate color from his left ear: and, on the eighth day, the right ear also began to discharge. The keratitis was treated by Dr. Weiss.

Present condition: In the external canals, a moderate quantity of pus. The right drum membrane is perforated in anterior lower quadrant, and the remainder is thick and red. The left drum membrane is perforated in lower posterior part, otherwise it is in the same condition as the right. Speech is heard, on the right side, at four metres; on the left, at one metre. Bone conduction: weak watch-tick is heard on both sides; tuning-forks on left side only. The case was treated by the dry method. In both ears the perforation closed in two weeks. His condition, at the time of his dismissal from my care, was as follows: acuity of hearing, R $\frac{1}{2}$, L $\frac{1}{4}$. Slight intermittent tinnitus. The vessels along the handle of the hammer were still injected.

The patient's demand for indemnification for damages from his employer was refused. Had I been asked by the court for my opinion, I should have given it in favor of the injured person, for his hearing, will never again be normal in either ear, and his left ear in which there is still constant tinnitus, may possibly in time become entirely deaf from labyrinthine disease.

EXTENSION OF A NON-SUPPURATIVE INFLAMMATION OF THE MIDDLE EAR TO THE PERILYMPHATIC SPACES OF THE LABYRINTH.

BY S. MOOS AND H. STEINBRUGGE, IN HEIDELBERG.

Translated by CHARLES J. KIPP.

AS the clinical history of the preceding case showed that the organ of hearing of the right side was likewise affected, and the *right temporal bone* had kindly been placed in our possession, we have examined this also. The result was as follows :

The mastoid process was also sclerotic ; the roof of the antrum measured three *mm.* in thickness ; the floor and the inner wall of the tympanic cavity were thickened and sclerosed. The sinus tympani was small and entirely filled with new connective tissue. There were adhesions between the limbs of the stapes, and in the niche of the oval, and of the round window. In the mucous membrane lining the plate of the stapes, and the ligament. orbiculare was found brown pigment. The lining membrane of the tympanic cavity was not materially changed. The drum membrane was retracted and funnel-shaped ; its mucous membrane was opaque. The ossicles were slender and movable. The tube was normal, without the slightest textural change, and without any accumulation whatever in its free space.

MICROSCOPICAL EXAMINATION OF THE LABYRINTH.

Most of the blood-vessels were empty in consequence of the hemorrhage. The membrane of the round window was thickened, and in its inner surface was a deposit of masses

of crumbling detritus consisting of cells, which also filled the aqueduct cochlea in one place. At the junction of the anterior with upper wall of the vestibulum, a string of connective tissue, starting from the periosteum, extended from one wall to the other. The ligamentous attachments of the utriculus and of the ampulæ were thickened. Much brownish-red and yellow pigment, partly in the form of globes (separate or in groups), partly in heaps of granules, was found on the horizontal ampulla and its semicircular canal. Some of this was found scattered also in the epithelium of the utriculus.

Remarks.—The condition here found presents a true picture of an inflammation which has extended from the middle ear to the labyrinth. Here it manifested itself principally as a periostitis of the vestibule, along with which were seen small extravasations and new growths of connective tissue. These changes, together with the alterations in the round window and the occlusion of the aqueduct cochlea, would seem to explain sufficiently the disturbance of function which existed during life. There can be no doubt that this began while the patient was ill with typhus fever, and was increased by the tubal catarrh which developed during the fatal illness.

THREE RARE CASES OF EAR AFFECTIONS AS A CONSEQUENCE OF SYPHILIS.

BY S. MOOS, OF HEIDELBERG.

FIRST CASE.—*Continuous subjective noises in the head with apparently normal acuteness of hearing, the result of syphilis.*

The patient, a merchant, thirty-four years old, consulted me on the 12th of November, 1879.

History.—About ten years ago the patient, according to his own account, suffered undoubtedly from a dry, wide-spread skin eruption and, judging from his description, from an impetigo capitis. At the same time he had also an affection of the throat, and a slight swelling of an inguinal gland. He had no sore on the penis and no suppurating bubo. Under the repeated administration of mercury, iodide of potassium, and Zitmann's decoction, and a course of baths at Aachen six years ago, the disease was brought to a standstill.

Last spring the eruption broke out afresh on the head and skin. Two courses of inunction and another trial of the warm sulphur springs at Aachen eradicated the disease so completely that I could not discover on the examination of the naked patient even the slightest anomaly either of the skin, glands, bones, or in the throat. For two years the patient has suffered from a continual noise; at first it was heard in both ears, then it moved into the head, principally in the parietal and occipital region, where he has heard it ever since. The before-mentioned treatment did not lessen it in the slightest degree. He has never as yet suffered from dizziness.

The *objective examination* of the nose, the naso-pharyngeal space, and the middle ear (with the catheter) gave an entirely negative result.

On the inner part of the superior wall of both external auditory canals, opposite the membrana flaccida, in a very symmetrical position is a heart-shaped white exostosis.¹

The vessels on the handle of the malleus are injected, otherwise nothing worthy of note. The acuteness of hearing tested by a small watch is normal both for aërial and bone-conduction; whispering is heard at normal distance, at least so far as I could make out clearly in the room at my disposal, which was fourteen metres long. Patient assured me, moreover, that he understood every whisper of the prompter from the top gallery of the theatre. *On the other hand bone-conduction was absolutely wanting even with the ear closed for C, C', and A' tuning-forks which were all heard through the air at a distance of fifteen ctm.* I prescribed bromide of potassium, but have not seen the patient since.

The important point in this case is the great difference in the acuteness of hearing by air-conduction on the one hand and by bone-conduction on the other. This great contrast is so entirely opposed to our experience as to the diagnostic value of the absence of bone-conduction, that one might be tempted, in view of the still present almost normal sharpness of hearing through the air, to seek the seat of the anatomical disturbance and the cause of the interrupted bone-conduction for all sounds elsewhere than in the labyrinth, especially as he had never suffered from vertigo.

When the perception of sounds through the bones of the head is wanting, it is generally regarded by all experienced scientists as a reliable sign of labyrinthine syphilis,² especially in young persons. But in such cases the perception of sound through the air is also greatly diminished, and the deafness is very considerable; while, in our case, the acuteness of hearing was relatively still very good, indeed 'nearly normal, and, as the patient assured me, continued so during the two years he has suffered from tinnitus.

¹ This condition has not the least connection with syphilis. Twelve years ago I described three such cases and found that these tumors are simple hyperplastic growths resulting from irritative processes at the time at which the annulus tympanicus unites with the squamous portion of the temporal bone, and that as symmetrical growths they have a certain analogy with the double-sided bony protuberances observed in the so-called spinous pelvis. (Compare "Symmetrical formation of exostoses in both the external auditory canals of man.")—ARCHIVES OF OPHTHALMOLOGY AND OTOTOLOGY, vol. ii., 1, page 136.

² Granting that the previous existence and the continuance of syphilis throughout the present condition is established by the history.

Nevertheless, if we wish to place the seat of the anatomical disturbance in the labyrinth, it is difficult to understand what kind of lesion that can be which allows such a remarkably good perception of sound-waves through the air. This would not be possible either in a simple hyperæmia, or in a serous or small-cell infiltration, or in a perioritis of the labyrinth. And assuming a change in the auditory nerve—to speak very generally—beyond the labyrinth, it is still very difficult to reconcile the great difference between perception through the bones and the air. In a central affection of the acusticus we would have to suppose a similar affection on both sides, which would be slightly increased and then remain stationary, perhaps under the influence of the various remedies. Concerning the *diagnosis of the nature* of such a change, however, we must enjoin the greatest reserve, in view of the total lack of convincing pathological and anatomical facts. In the case in question we cannot make the little that is known of diagnostic value. According to Virchow,¹ “it cannot be doubted that sometimes gummata of the brain or base of the skull involve the acusticus,” and E. Wagner² says “but few syphiloma of the nerves have been hitherto described.” Probably the Dixon³ cases belong here. The affected nerves in one of the cases were preëminently the opticus, the oculomotorious, and the abducens of the left side, and the trigeminus of the right side. The work, which is otherwise so rich in careful observations, comprises nothing about a similar change in the auditory nerve.

SECOND CASE.—*Rapid and complete destruction of hearing, first on the left side simultaneous with a slight apoplectic attack, then on the right without it, in consequence of syphilis.*

The patient, forty-five years of age, consulted me in the beginning of July, 1880. He said that twenty years before he had been specifically infected, but after two months was fully restored, and then had been entirely well until five years before. At that time he sustained a slight apoplectic attack without loss of conscious-

¹ “Krankhafte Geschwülste.” Bd. II, page 463.

² *Archiv der Heilkunde*, 4 Jahrgang.

³ *Med. Times and Gazette*, October, 1858.

ness, with total permanent deafness of the LEFT SIDE, permanent subjective auditory sensations, and sensation of formication in the right hand and foot, which continued for a long time and then gradually disappeared. Four days before—in the night between the 4th and 5th of July—he also *completely lost the hearing of the right side* without any other appearance of disease that could have pointed to a central affection, at the same time with violent subjective auditory sensations—the ringing of bells, etc. *He has never suffered from dizziness.*

The objective examination, with the exception of the injection of the vessels on the handle of the malleus, was negative. Hearing absolutely destroyed. A course of sweating and inunction taken under the direction of Friedreich in the Academic Hospital and the use of Zittmann's decoction were entirely without result, as far as hearing was concerned; only the noises became fainter, and the patient afterward felt physically better, especially in the head. I advised him to enter a school for deaf-mutes.

The *origin* of the disturbance described can be most easily explained if we suppose the patient to have a *syphilitic disease of the vascular system*. Under the influence of this the simultaneous appearance of blood extravasations in different places¹ would not be strange, as in the first attack in the brain and labyrinth. That hemorrhages in the cochlea occur as attendant changes with hemorrhage of the brain, I convinced myself years ago in a cadaver in a case of hemorrhage in the brain.² In the second attack, when hearing on the right side was destroyed without the appearance of any other symptom, we must suppose an isolated hemorrhage in the cochlea from the same anatomical cause—syphilitic changes in the vessels.

If we would allow only a central lesion for each single attack, we must suppose an extravasation limited to the root of the acusticus between the outer and inner nucleus. This would certainly be a remarkable accident, which would hardly have repeated itself in precisely the same manner in one and the same patient.

¹ Or the formation of autochthonic thrombi?

² ARCHIVES OF OPHTHALMOLOGY AND OTOTOLOGY, vol. iv., page 498. Besides the cerebral hemorrhage in consequence of chronic endo-arteritis, all the cochlear convolutions on both sides showed signs of fresh and old hemorrhages.

THIRD CASE.—*Labyrinthine affection of both sides—the result of syphilis—Marked improvement after two years' duration of the trouble.*

The patient, twenty-eight years old, consulted me August 7, 1882. She was specifically infected two years ago. She is being treated at the same time by Drs. A. Weil and Kehrer for an eruption, an ulcer on the right tonsil, and a recto-vaginal fistula. She suffers from violent vertigo, constant noises on both sides, and nausea. She hears loudly spoken words. Watch, $\frac{1}{1000}$ for each side. *Bone-conduction for watch and tuning-fork totally lost.* The membrana tympani and middle ear normal.

In a consultation with Dr. Weil it was decided, because of the diagnosis of a specific affection of both labyrinths, that the patient should continue as before to take Root Laffecteur with iodide of potassium. As Dr. Weil informed me, after the vacation, the patient was relieved of her trouble by the further use of this remedy, and the recto-vaginal fistula was operated on successfully by Dr. Kehrer. Vertigo ceased, and hearing was *notably improved*. I had no further opportunity to examine the patient myself.

We can place the seat of the anatomical lesion in this case with tolerable certainty in the labyrinth, and, as there was violent vertigo, in the *entire labyrinth*. Probably the trouble was a small-cell infiltration of the lining membrane of the wall of the labyrinth, as I have described it in *Virchow's Archives*, vol. xxxix., page 313.

The case is especially deserving of notice if we compare the functional examination with that of the first case, inasmuch as in this, the third case, severe deafness went hand in hand with loss of bone-conduction, and hearing returned with the abatement of the other labyrinthine symptoms, vertigo and nausea. As to the condition of the bone-conduction when the cure was completed, I had unfortunately no opportunity to ascertain personally.

TWO CASES OF TOTAL LOSS OF HEARING OF ONE EAR FROM MUMPS.

By CHARLES J. KIPP.

TO the cases already on record I can add two others, both of which are, I think, of sufficient interest to warrant their publication.

CASE I.—*Total loss of hearing of right ear only, first noticed fifteen days after the commencement of an attack of mumps, while the patient was suffering from metastatic inflammation of the left testicle.*

The patient, a young man eighteen years of age, I saw in consultation with Dr. Chambers, of East Orange, who treated the patient from the beginning of the attack of mumps. The first symptoms of parotitis showed themselves on March 19th; both sides were affected; the attack was only of moderate severity. On the sixth day of the disease inflammation of the left testicle set in, and on April 3d, fifteen days after the mumps began, and while the orchitis was subsiding, the patient first noticed that he was deaf in his right ear. The swelling of the parotid glands had at this time entirely disappeared. No tinnitus and no vertigo were noticed at this time. He was somewhat nauseated and vomited a few times. He had no pain in his ears. Dr. Chambers, who is thoroughly familiar with ear diseases, made at once an examination of the ear and found it to be normal in appearance. There were no signs of inflammation, either in the external canal or in the middle ear. Inflation of the middle ear produced no improvement in hearing.

A week after the deafness was first noticed I had an opportunity to examine the case.

I found that the left ear was entirely normal in appearance, and its hearing power uncommonly acute.

The right ear was totally deaf. With the left ear closed as much as possible, he was able to hear words spoken very loudly, but he heard them as well when the right (deaf) ear was also closed. The tick of the watch he heard on the right side only when the watch was pressed against the mastoid process, and then he heard it in the *left* ear. Tuning-forks of different pitch were not heard when held in air in front of external meatus (with the other ear closed), but were heard from mastoid. When placed on vertex or held between teeth the tuning-forks as well as the watch were heard only in the left ear, and this result was not changed by closing the right ear as much as possible with the fingers.

The external canal was normal. The drum membrane normal in color and transparency. The light spot was of good size and in normal position. There was not the slightest injection of the vessels of the dermoid layer. The drum membrane was in normal position, and its mobility was unimpaired. The Eustachian tube was very pervious; even slight pressure in making the Valsalvian experiment causing the membrane to move outward. The sounds on inflation through the catheter were broad and dry. Not the slightest evidence of disease of the middle ear could be discovered. The mucous membrane of the naso-pharyngeal space was still congested and somewhat swollen. There was no facial paralysis.

Since a few days the patient has slight intermittent ringing in this ear, but he is not at all annoyed by it. He is not now and has not at any time been dizzy. His gait is perfectly steady. The sickness of the stomach, which was present at the commencement of the aural trouble, has passed off.

As inflation had no effect on the deafness, it was soon given up. Iodide of potassium was given for weeks; then pilocarpine was tried, and blisters were applied over the mastoid, but all was of no avail. The ear remains absolutely deaf.

Compared with the cases on record this one differs from all the others in this, that the deafness was developed while the patient was suffering a metastatic orchitis.¹

As to the part of the ear affected there is no doubt in my

¹ While this paper was in the hands of the printer I found the report of a very similar case observed by Henry D. Noyes, in the Transactions of the American Otological Society, 1879, page 342. In this case the ear symptoms appeared before the orchitis. Vertigo, tinnitus, and vomiting were prominent symptoms.

mind. The sudden and complete loss of hearing observed in this case can only be accounted for by an affection of the nervous apparatus of the ear. There were absolutely no manifestations of cerebral disease, and from this it is only fair to infer that the seat of the disease was not within the cranial cavity. It must therefore have had its seat in the labyrinth. And as all signs of irritation of the acoustic nerve were absent, such as tinnitus aurium, vertigo, and disturbances of equilibrium, it seems highly probable that the disease was limited to the cochlea. Nausea and vomiting were present it is true, but as these symptoms seem to have troubled the patient before the deafness was noticed, it seems probable that they were due to the orchitis. As to the nature of the morbid process in the cochlea, whether it was an inflammation with serous or hemorrhagic effusion or embolism of the cochlear artery, I shall not make a guess.

While I do not doubt that in some of the cases of deafness from mumps disease of the middle ear was present, and was perhaps the sole cause of the deafness, there is not the slightest evidence in this case that the middle ear was in the least affected during the patient's illness. Dr. Chambers examined the ear immediately after the deafness was noticed and found no signs of inflammatory disease about the external canal or the middle ear. Moreover, there was not at any time the slightest pain in or about the ear. I saw the patient a week later and found nothing abnormal about the external and middle ear, not even a trace of a former inflammation of these parts. This absence of all change in the drum membrane in this case, as well as the suddenness of the loss of hearing, certainly speaks strongly against the hypothesis that the disease did have its seat in the middle ear. Among the many hundreds of cases of recent deafness in which the tuning-fork test indicated middle ear disease in young and old people that have come under my observation, I do not think that I ever saw one in which there was not either a change in the membrana tympani or a movable exudation in the drum cavity,—and in which treatment did not produce some improvement.

As to the cause of the ear affection in cases of mumps I

have no theory to offer, but it may not be out of place here to say that an extension of the disease from the parotid gland to the ear, along the facial nerve or through the external canal and tympanic cavity, seems to me highly improbable, and that I think it much more likely that the inflammation of the parotid, the orchitis, and the ear affection are merely local expressions of the same morbid condition of the blood. Some years ago I saw a child who while suffering from scarlet-fever became suddenly blind in one eye. The examination revealed the same picture which is seen in cases regarded as embolism of the central artery of the retina. The child was free from disease of the heart, and had neither at that time nor later albumen in the urine, and recovered its health entirely, but of course remained blind in this eye. There is, it is true, no evidence that in this case an embolus really caused the blindness, but since in a few cases in which there was the same sudden loss of vision, and which presented precisely the same picture of the fundus oculi, an embolus was found in the artery mentioned, we may assume that the cause of the blindness was the same in my case. Now if such an occurrence can take place in the course of scarlet-fever, why is it not possible that in some of these cases in which only one ear becomes deaf from mumps—a disease in many respects like scarlet-fever—the loss of hearing may be produced in the same way? The very sudden and painless destruction of the hearing power observed in this case is so much like the sudden and painless loss of vision observed in cases of so-called embolism of the cerebral retinal artery, that I have thought it worth while to call attention to it.

CASE 2.—*Total and sudden loss of hearing of one ear during an attack of mumps.*

F. M., fourteen years of age, consulted me in June, 1883, for deafness in both ears. From his statement it appeared that two years before he had bilateral mumps, and that while suffering from this disease, he suddenly became deaf in left ear, and has remained so since. Neither he nor his father remembered whether sickness of stomach, dizziness, or staggering gait were present at that time, but thought that they would have remem-

bered it if such had been the case. Since then he has had neither dizziness nor difficulty in walking. Four weeks ago he contracted a severe cold in the head, and since then the hearing of the right ear has also been greatly impaired.

On examination I found that he was totally deaf in the *left* ear, the one in which the hearing was lost from mumps. Neither speech, nor watch, nor tuning-fork were heard in this ear. Placed on vertex or between teeth, tuning-forks and watch were heard only in right ear. The right ear heard tick of watch only when this was pressed against the ear. Tuning-forks were heard in air and through bone on this side.

The left ear was found in the following condition: external canal capacious and free from disease. The drum membrane was perhaps slightly more transparent than commonly, but otherwise entirely normal. There was no retraction and no impairment of its mobility. The Eustachian tube was pervious. Air entered tympanic cavity freely on making Valsalvian experiment. The middle ear was, as far as it is possible to ascertain this, in a healthy condition.

The *right ear* showed all the usual signs of an acute catarrhal inflammation of the middle ear. The drum membrane was injected and somewhat swollen, and slightly bulged in posterior half. The Eustachian tube was pervious. He had considerable nasopharyngeal catarrh. He was treated for this in the usual way, and when last seen, a month later, his hearing was nearly normal. Since then I have not heard from him.

This case is interesting simply from the fact that two years after an attack of ear trouble leading to complete and permanent deafness of one ear, he was attacked in the other ear by a probably entirely different disease. In this case naso-pharyngeal catarrh may have existed before the parotitis developed, and the ear disease which occurred during the attack of mumps may have been a middle-ear affection. The slightly atrophic drum membrane would certainly support such an assumption, but if the primary ear trouble was seated in the middle ear, it must have caused secondary labyrinthine disease, for the deafness of this ear was complete, as was shown by the tests with the tuning-fork.

STATISTICAL REPORT OF THE CASES TREATED DURING THE YEAR 1883 IN MY POLICLINIC FOR DISEASES OF THE EAR AND NOSE.

By DR. ARTHUR HARTMANN, BERLIN.

Translated by Dr. J. B. McMAHON, New York.

THE polyclinic has been in existence since October, 1881, and has enjoyed a steadily increasing attendance. In the year 1881, 92 patients came under treatment, in 1882, 981 patients, whilst in 1883 the number grew to 1,188, exclusive of those who remained under treatment from the previous year.

The following forms of disease came under observation :

NAME OF THE DISEASE.	NO. OF CASES.
External Ear.	
Eczema of the auricle and meatus	13
Perichondritis of the auricle	1
Furuncles in meatus	39
Diffuse inflammation of the external ear	9
Inspissated cerumen	106
Foreign bodies	18
Fungi	1
Other diseases (1 abscess of lobule, 1 lupus of the auricle, 2 cholesteatomata)	4
Myringitis	1
Rupture of drum membrane	2
Congenital closure of external meatus	1
Middle Ear.	
Otitis media acuta	197
Swelling of the tube	108
Chronic middle-ear catarrh without perforation	34

Chronic purulent inflammation of middle ear :

(a) Simple	137
(b) With formation of polypi	35
(c) With caries and necrosis	17
Sequelæ of purulent inflammation of middle ear	83
Sclerosis of middle ear	79
Otalgia	14
Injuries of the middle ear	4
Tinnitus without objective phenomena	6
Syphilis	4
Other diseases (1 otitis diphtheritica, 1 irritation of the chorda tympani, 1 tympanophony)	3

Nervous Apparatus.

Affections of the labyrinth	20
Ménière's symptom-group	9
Deaf-mutism, congenital	2
" " acquired	6
Fracture of the petrous bone	7

Nose and Naso-Pharynx.

Acute catarrh	9
Chronic catarrh :	
Simple	83
With polypoid hypertrophy	17
Nasal polypi	28
Eczematous affections of the nostrils	38
Ozæna	25
Epistaxis	6
Syphilis of nose	10
Foreign bodies in nose	3
Adenoid growths in naso-pharynx	32
Chronic pharyngeal catarrh incl. tonsillar hypertrophy	34
Syphilis of pharynx	4
Other diseases of nose (erythema, 2 ; acne, 4 ; herpes, 1 ; abscesses of the external nose, 2 ; diphtheria of nasal mucous membrane, 2 ; paralysis of velum, 3 ; malignant neoplasms, 2)	16

Unclassified Diseases.

Parotitis, 2 ; affections of the temporo-maxillary articula- tion, 2 ; glandular swelling in neck, 3 ; goitre, 4 ; cephalæa, 3 ; salivary calculus, 1 ; fish-bone in base of tongue, 1 ; idiotism, 1 ; trigeminal neuralgia, 1	18
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The 1,188 patients presented 1,283 forms of diseases, 960 diseases of the auditory apparatus, 305 of the nose and naso-pharynx, and 18 others.

The following operations were performed :

Incisions in external meatus	19
Removal of foreign bodies from the ear (including one sequestrum)	19
Paracentesis of drum membrane	25
Removal of aural polypi	30
Syringing with use of the tympanum tube	9
Opening of abscesses over the mastoid process	11
Opening of mastoid process	14
Galvano-caustic operations for chronic nasal catarrh	12
Abscission of polypoid hypertrophies	16
Removal of nasal polypi	29
Abscission of adenoid growths	33
Galvano-caustic operations in pharynx	2
Abscission of tonsils with the tonsillotome	6
Removal of foreign bodies from the nose	3
Abscission of the anterior portion of the middle tur- binate with the conchotome. ¹	3
Opening of glandular abscesses of the neck	4
Total	235

The ear was the seat of the operation in 127 of the 235 operations, the nose and naso-pharynx in 108.

With such an abundance of material, many points of interest claim special attention. Some individual cases have already been communicated to the Naturforscher Versammlung in Freiburg; others will be utilized in the new edition of my text-book "Diseases of the Ear and their Treatment." (Translation into English by Dr. Sinclair to appear; G. P. Putnam's Sons.—ED.) Later, I will take occasion to make further reference to these observations. For the present I shall confine myself to a separate consideration of the fourteen cases of chiselling of the mastoid process.

¹ Presented in the otological section of the Naturforscher-Versammlung, in Freiburg.

FOURTEEN CASES OF CHISELLING OF THE
MASTOID PROCESS PERFORMED IN THE
POLICLINIC DURING THE YEAR 1883.

BY DR. ARTHUR HARTMANN, BERLIN.

Translated by Dr. J. B. McMAHON, New York.

OF the fourteen cases which required the opening of the mastoid, there were four in which the mastoid disease was the direct result of acute inflammation of the middle ear. The outer surface of the mastoid process was sound in two of these four cases at the time of the operation; in the other two, abscesses and fistulas had already developed. In one of the former the suppuration travelled through the inner surface of the mastoid process, as first described by Bezold. The remaining ten cases presented complications of chronic suppuration of the middle ear, as follows: formation of sequestra in four (two adults, two children), four cases of caries in children, one case of formation of polypi in the middle ear and mastoid process, and one case of cholesteatoma in an enlarged mastoid antrum. Death resulted in two cases, in one of which facial paralysis and symptoms of meningitis had developed before the operation. In the second case the operation was proposed as a last resource, pyæmia and thrombosis being present, so that the prognosis was in the highest degree unfavorable.

Although the literature of late years presents apart from the numerous cases of Schwartze, many histories relating to the artificial opening of the mastoid, it may be allowable to enter somewhat more fully upon such of the operated cases as seem to be of special interest, whilst for the others I shall confine myself to a few remarks.

CASE 1.—Acute Inflammation of the Middle Ear with Involvement of the Mastoid Process. Chiselling of the Mastoid Process, the Outer Surface Being Sound. Cure in 7½ Weeks.

T., clerk, æt. twenty-three. Acute right otitis media since October 4, 1883; accompanied from the beginning by very severe pain in the ear, in the mastoid region and in the right temple. Four days after the invasion of the disease a perforation of the drum membrane took place spontaneously without recedence of the distressing symptoms. The pains under the use of ice and leeches did, indeed, diminish but returned with great severity. The auditory canal was early involved in the inflammation and, in particular, the posterior wall was carried strongly forward, while the posterior portion of the drum membrane projected markedly outward. Repeated incisions, as well as instillations of alcohol, produced no improvement. The alcohol passed into the nasopharynx. The secretion was always considerable. As the condition was not altered by the treatment, and the pains extending to the back of the neck and occiput became steadily worse, the externally sound mastoid was chiselled open on November 25th. The incision was made at the line of attachment of the auricle and at the height of the external meatus. It was necessary to penetrate about one cm. before reaching pus and granulation tissue which filled a large cavity extending forward and backward. The granulations were removed as much as possible with the sharp spoon. The bleeding which accompanied the penetration of the bone was considerable and became quite profuse during the removal of the granulations. Fluids injected into the auditory canal did not pass through the cavity. The after-treatment consisted in the introduction of a thick rubber drainage-tube, later of a lead tube, insufflations of iodoform, and carbolized injections. The painful symptoms disappeared after the operation, no febrile movement ensued, the discharge from the auditory meatus became less. During the after-treatment granulations in the cavity had repeatedly to be removed with Wolf's spoon, and the gouge was once used to widen the inner part of the canal leading to the cavity, in order to keep it open for inspection. Not till the latter part of December did injections into the cavity find their way into the external auditory canal and nasopharynx. After this the secretion soon fully ceased, the perforation of the drum membrane closed, and the normal markings of

the membrane became gradually recognizable. The rubber drain was replaced by a lead tube. This was removed on January 9th. On January 11th, the canal left by the operation had completely closed. On January 26th, the watch was heard at 40 *cm.*, loud speech at six metres.

CASE 2.—Acute Inflammation of the Middle Ear. Passage of Pus through the Inner Surface of the Mastoid Process; Deep Abscess in Neck. Chiselling of Mastoid Process, Outer Surface Being Healthy. Cure in 11 Weeks.

Grigat, æt. sixty, packer. Patient who had previously enjoyed good health, was taken last June with pains in the left ear, which gradually increased and involved the whole side of the head. He sought the aid of Prof. Berthold (Königsberg), who gave him considerable relief by the use of the air-douche (tread-ball). The pain soon returned and paracentesis was performed. This again gave temporary relief, but the pain again developed and also attacks of vertigo. The patient was now sent to a hospital, where insufflations of a "white crumbly powder" were used. No improvement resulting, he came here at the wish of his family. At the first examination (August 23, 1883) a narrowing of the auditory canal and a small granulation in a perforation at the lower part of the drum membrane were observed. Small pieces were again and again removed with the snare and the sharp spoon but the pains continued. There was easy communication between the auditory canal and naso-pharynx, and instillations of alcohol, which were never unpleasant to the patient, always passed readily into the naso-pharynx.

Before he came here for treatment, the patient had already complained of pains in the region of the left sterno-cleido-mastoid, where there soon developed quite a hard swelling, slowly increasing in extent. The swelling was situated in the middle of the lateral cervical region, behind the sterno-cleido-mastoid. Applications of tincture of iodine and unguentum hydragri proved of no avail. By the middle of September, it became evident that pressure on the swelling caused a profuse flow of creamy pus from the auditory canal, and the patient was referred to the Hedwig Hospital for the opening of the deep-seated abscess. A deep incision was made under an anæsthetic, and a drainage employed. After a stay of three days in the hospital, the patient returned and now carbolic solutions could be forced into the auditory canal

from the abscess, which was situated in the middle of the lateral cervical region, the liquid having thus passed through the abscess cavity, the mastoid process, and the tympanic cavity. The pains became somewhat less after this, but there remained a free discharge of pus from the abscess and from the auditory canal. The expectation that a cure would now result proved erroneous. The secretion and pain persisted though in a less degree. The condition of the patient deteriorated. It was a matter of surprise that the mastoid process was sensitive only in the early part of the disease, and that there never had been swelling or redness over it. On November 6th, the mastoid process was chiselled open. An incision was made in the skin at the attachment of the auricle. A considerable amount of pus escaped after the first few blows of the chisel. When the opening had been enlarged a cavity was disclosed lined with granulations. These being removed, a passage was seen in front and a large cavity behind. The granulations and the decaying bony tissue were now as much as possible removed with the spoon. No connection with the tympanic cavity or with the abscess of the neck was discovered. It was supposed that this would be established in a few days, and so the operation was not pushed further. Powdered iodoform was blown into the cavity, a thick drainage-tube inserted, and salicylated cotton used as a dressing.

On the second day after the operation, the first dressing was changed, injected fluids found their way in small quantity into the fistula of the neck, and, more freely, into the external auditory canal. For some days granulations had repeatedly to be removed with Wolf's spoon. It now appeared that fluids injected into the fistula of the neck escaped through a narrow cleft in the wall of the mastoid, situated between the anterior and posterior cavities. This cleft was enlarged with the chisel, the patient sitting in a chair, no chloroform being administered. After a half-hour's work, a canal had been made, 1 *cm.* deep, of the thickness of a lead-pencil, leading into another cavity filled with granulations. The entire procedure caused absolutely no pain, the patient submitting to the chiselling of the solid bone without moving a muscle. The parts were completely insensitive. After clearing this newly discovered cavity with the sharp spoon, a large stream of water was passed from the fistula of the neck through the opening in the mastoid, and also in a reverse direction. Later on in the after-treatment it was again and again requisite

to remove the luxuriant granulations with the sharp spoon or to cauterize them with nitrate of silver. Although the greatest attention was given to maintaining a free communication, the discharge of pus, particularly from the neck, remained at first very considerable, then gradually diminished. Toward the end of December, a thick lead tube was inserted; in the beginning of January, 1884, a thinner one. The secretion now steadily decreased, so that on January 16th, even the thin lead tube could be discontinued. In two days the opening had closed. A few days later the already shortened rubber drainage-tube was removed from the fistula of the neck, which soon healed. The process in the tympanic cavity had also in the meantime resulted in a cure with complete restoration of the drum membrane, which curved strongly forward during the Valsalvian experiment. Watch heard at 2 *cm.*, whispered speech at 1½ metres.

CASE 3.—Acute Inflammation of the Middle Ear. Formation of Abscess and Fistula in the Mastoid Process. Enlargement of the Fistula with the Chisel. Cure in 4½ Weeks.

Berghard, mason, æt. seventy-three, took sick July, 1883, with severe pain in the left ear and left half of head, accompanied by difficulty of hearing and loud roaring. Patient came under treatment on July 13th; in addition to severe inflammation of the middle ear there was swelling over the mastoid and very acute pain in the mastoid and temporal regions. Treatment consisted in applications of tincture of iodine, ice, and leeches. A small amount of secretion was evacuated by a paracentesis on July 18th. A collection of pus over the mastoid process was opened on August 3rd. No fistula was detected by the probe in the mastoid, which was not covered with periosteum. As there was no diminution of the pain in the mastoid or of the headache, the mastoid was chiselled open on August 9th, under chloroform. A fistula of the bone was discovered about 1 *cm.* behind the line of attachment of the auricle. This was enlarged forward to a considerable extent. Granulations were met at the depth of about 1 *cm.* and were removed with the sharp spoon. Iodoform was blown into the cavity. The opening was kept patent by a rubber drainage-tube, later by a lead tube. Strange to say, the pains did not cease immediately after the operation, lasting, though in a less degree, for the next fourteen days. A thin lead tube could be inserted at the end of the month. The opening had closed on September 10th.

CASE 4.—Acute Inflammation of the Middle Ear. Formation of Abscess and Fistula in the Mastoid Process. Enlargement of the Fistula with the Chisel. Cure in 4½ Weeks.

Geisler, mason, æt. thirty-four, contracted in February, 1883, an acute inflammation of the middle ear, without urgent symptoms. Four weeks after the beginning of the attack severe pain and swelling in the region of the mastoid process set in. The patient was admitted to the polyclinic on March 27th. There were present a moderately large perforation in the anterior portion of the drum membrane, some slight swelling of the auditory canal, redness and swelling over the mastoid process. The otorrhœa was considerably lessened by the use of the air-douche and boric acid. The process in the mastoid went on to the formation of abscess in spite of the use of cold applications and of tincture of iodine. On April 10th, a small abscess was opened. At one spot the surface of the bone was found entirely divested of periosteum. As, despite this procedure, the swelling and acute pain persisted, the mastoid was chiselled open on April 22d, under chloroform. A longitudinal incision was made through the fistulous opening, which was situated 1 cm. behind the attachment of the auricle. The opening was enlarged by an incision at right angles to the former, running forward. After the removal of over a square centimetre of the corticalis, the granulations which filled the subjacent cavity of the mastoid process were removed with the sharp spoon. No connection between this cavity and the tympanum was discovered. Powdered iodoform was sprinkled in, and a thick rubber drainage-tube inserted. A salicylated cotton dressing applied. The swelling rapidly subsided and the pain ceased immediately after the operation. Fourteen days later, the opening was so much diminished in size by granulations that only a small lead tube could be inserted. The secretion was exceedingly slight. On May 18th the patient at his own wish was allowed to go to work with the lead tube in position. Closure of the opening on May 26th.

CASE 5.—Chronic Suppuration of the Middle Ear. Formation of Abscess and Fistula in the Mastoid Process. Enlargement of the Fistula with the Chisel. Removal of Two Sequestra. Cure in 4 Weeks.

Heinrich Sauer, laborer, æt. twenty-nine, has suffered since childhood from otorrhœa with marked deafness on the left side. In De-

cember, 1882, the patient after immoderate exertion was seized with a pain in the left ear, accompanied later by severe vertigo and headache, both of which persisted several months with short intermissions. In June, 1883, acute pains over the entire left half of the head developed with a gradually increasing swelling, reaching from behind the auricle to the occiput. In August, the patient noticed that a free discharge of pus from the ear occurred, whenever he pressed on the swelling. When he came to the Polyclinic on August 17th, the abscess was opened by a large incision and drained. Injected fluids passed through the auditory canal. The probe when passed forward touched rough bone at a depth of about 3 *cm.* In the ear itself were found large polypi with pedicles which were approached with great difficulty, on account of the markedly narrowed auditory canal. These polypi were removed, in great part, with the snare and sharp spoon. After the opening of the abscess the subjective condition of the patient improved materially, the pains disappearing. There remained, however, a free secretion from the auditory canal and from the fistula. On November 3d, therefore, the mastoid was chiselled open. The fistula was laid bare and enlarged backward and upward; a canal of about 1 *cm.* in depth was made before the cavity in the mastoid process was exposed, full of spongy granulations. The probe detected movable bone behind and below. In order to remove this, the canal had to be enlarged considerably. The piece removed was over the size of a bean. An equally large piece could be removed after the extraction of the first. Powdered iodoform was insufflated into the very large cavity, and a thick drainage-tube inserted. Two days later, dressing removed, the wound granulating nicely, secretion scanty. The wound-cavity rapidly filled with healthy granulations and decreased in size. At his own wish, the patient was allowed to return to work after fourteen days. By the beginning of December the fistula had fully closed.

CASE 6.—Chronic Suppuration of the Middle Ear. Formation of Abscess and Fistula in the Mastoid Process. Repeated Spontaneous Discharge of Small Sequestra. Enlargement of the Fistula with the Chisel. Removal of Granulations and of Several Small Sequestra with the Spoon. Cure in 5 Weeks.

Kannegiesser, æt. twenty-five, post-office official. Has had an otorrhœa from childhood and has always been scrofulous (extrir-

pation of glands, etc.). After a fall on the chin, five years ago, he was suddenly taken with headache, general malaise, and soon with fever. After four to six days a large swelling formed behind the ear which soon involved the whole side of the head. An incision made behind the ear fourteen days later, evacuated a large quantity of pus. The swelling, however, increased so that he was obliged to enter the "Charité," where he was operated on under an anæsthetic (presumably six incisions were made, the scars of some of which are yet to be seen over the occiput). Discharged after six weeks. Two splinters of bone were discharged by degrees with the pus, and a fistula remained three months. The otorrhœa had never ceased meanwhile, and when after about nine months pains developed behind the ear, the patient presented himself to me for aid. He refused the operation then declared necessary. His condition remained unaltered till the summer of 1883. The otorrhœa continued, a small piece of bone again had been discharged, the fistula occasionally healed, only to break open again. Three months ago the headache increased, secretion, dizziness, and anorexia had returned, and they persisted with varying intensity till September 20, 1883, when the patient came to the Policlinic.

He was operated on September 23, 1883. The integument covering the fistula was incised, and the cut enlarged posteriorly so that two large skin-flaps were formed. A large piece of the corticalis of the mastoid process was chiselled away, a quantity of inspissated cholesteatomatous pus was removed from the antrum by means of the inflexible tympanum-tube, and two small sequestra and many small granulations were drawn out. There was always free communication with the auditory canal. The course of the disease was not entirely free from fever. At night the pains in the head regularly returned; the condition improved after insufflations of iodoform, begun on Oct. 2d. The secretions became less and less, granulations had repeatedly to be removed. After a month the drainage-tube could be left off, whereupon prompt and complete closure of the opening ensued.

CASE 7.—Chronic Suppuration of the Middle Ear, with Formation of Polypi. Abscess and Fistula in the Mastoid Process. Enlargement of the Fistula with the Chisel. Cavity Cleared with Spoon. Cure in 10 Weeks.

Anna Bolz, æt. four. On Jan. 5, 1883, was taken with scarlet-fever and diphtheria. After eight days severe pains and bilateral

otorrhœa appeared. In February the secretion diminished slightly, and behind the right ear there formed a large swelling, which demanded incision. The secretion was in no way diminished, but the general condition of the patient improved considerably. The fistula remained open, and when some months later the child began to complain and vomit, the mother sought assistance in the Policlinic. Extensive caries and masses of polypi, almost filling the entire right auditory canal, were discovered, and an operation proposed. The mother, however, refused. As the headache and vomiting became steadily more severe, and high fever set in, the mother at last consented and the mastoid was chiselled open on September 23, 1883. After the antrum had been exposed, a large quantity of granulations and also a sequestrum were removed. During the after-treatment an intercurrent nephritis. Closure of the wound at the end of December. Four weeks later a small abscess developed at the cicatrix; it was opened, and drained for fourteen days. Since then till the end of February the cure has been complete. The lower wall of the auditory canal is strongly incurved, the anterior half of the drum membrane is destroyed, in the posterior half is seen a depressed cicatrix.

CASE 8.—Chronic Suppuration of the Middle Ear, with Perforation of Schrapnell's Membrane and Formation of Polypi. Formation of Immense Abscess over the Mastoid Process. Symptoms of Pyæmia and Thrombosis of the Sinuses. Chiselling of the Mastoid Process. Removal of a Sequestrum and of Cheesy Masses from the Mastoid and the Tympanic Cavity. Death 6 hours after Operation.

Anna Zessin, æt. eleven. At the age of four, pain in the ear, with subsequent otorrhœa. Otherwise had been a healthy child. In June, 1882, the patient complained of severe pain in the right ear. Under chamomile fomentations and warm injections the ear began to discharge, and the pains decreased. As her condition fluctuated considerably, the patient came for assistance to the Policlinic in Aug. 14, 1882. A small perforation in Schrapnell's membrane, immediately over the short process, was discovered, though concealed at first by a small polypus projecting through it. After this had been removed, and the pedicle cauterized, the secretion did not diminish, in spite of several months' treatment with alcohol and cauterizations of the granulating border of the per-

foration. In July, 1883, the patient again discontinued treatment after the perforation had been closed by a polypus growing through it. On October 17th, she again presented herself, having been confined to the bed for fourteen days with severe pains in the head and violent fever and chills. There developed now a marked œdema of the entire right side of the face, especially of the lower lid, and a swelling behind the ears of almost the size of a goose-egg, from which an incision evacuated an immense quantity of very fetid pus, containing some air bubbles. It was impossible to discover any communication with the ear. The subjective condition improved, but on October 19th, toward evening, a severe chill came on, with pain in the head and violent emesis. On the 20th, the patient fell into a pretty deep stupor, and the granulations assumed a discolored appearance. Her condition improved after injections of a weak carbolic solution through the tube, and inflations with air. On October 23d, there was communication between the ear and the wound-opening. On the same evening she had another chill, violent headache, and vomiting. This troublesome condition having lasted till the morning of the 24th, the mastoid was chiselled open at 1 P.M., in narcosis, and a sequestrum the size of a pea, some granulations, and, by means of the tympanic tube, a large quantity of cheesy pus were removed. After waking, the patient felt much better, chatted again, but complained of thirst, and suddenly, at 5:45 P.M., of severe earache. After a short time she turned over on account of marked dizziness and slept quietly. She died about ten minutes later. A gradually increasing ptosis of the right eye had been noticed since noon. No convulsions. Autopsy refused.

CASE 9.—Chronic Suppuration of the Middle Ear. Formation of Abscess and Fistula in the Mastoid Process. Enlargement of the Fistula with the Chisel. Cavity Cleaned with Spoon. Cure in 6 Weeks.

Gretchen Jakaboursky, æt. five. For one and three fourth years bilateral otorrhœa following scarlet-fever, persisting on both sides with varying intensity. As a sequel to a light laryngeal diphtheria in the beginning of September, 1883, appeared severe pains and profuse discharge from both ears. After about eight days a large swelling with violent pain began to form in the region of the mastoid process, the discharge remaining as profuse as ever. On September 19th, incision and drainage. As the swelling in the neighborhood of the wound did not diminish, and as there

was considerable infiltration, especially of the posterior lip of the wound, with no lessening of the headache, the mastoid was chiselled open on October 8th. After the operation no communication with the ear was found, but when a considerable quantity of inspissated pus and granulations had been removed, the swelling around the wound decreased and the patient's general condition improved. On November 1st another attack of diphtheria (the whole pharynx was white), and later a renewed profuse discharge. On November 8th a small splinter of bone came away from the wall of the wound, and since then there has been communication between the wound and the auditory canal. The wound now diminished rapidly in size; in the latter half of the month the lead tube was left off, and complete closure and cicatrization ensued. The discharge from the ear had meanwhile also ceased, and had not returned at last examination (in the beginning of February). There remained a perforation involving the anterior half of the drum membrane.

CASE 10.—Chronic Suppuration of the Middle Ear, with Formation of Polypi and Frequent Abscesses in the Mastoid Process. Chiselling of the Mastoid and Removal of Contents with Spoon Done Twice. Cure with Persisting Cicatrized Fistula in the Mastoid Process 3 Months after the Last Operation.

Marie Jorgs, æt. four. Has had a right-sided otorrhœa since one and a half years old. One year ago, after a fall on the head, an abscess formed behind the ear. The patient was treated in the Charité for four months, when the abscess was opened and a piece of bone removed. The wound behind the ear healed. The discharge from the middle ear persisted. The patient presented herself at the Policlinic on June 10, 1882. A few days previously an abscess had formed over the mastoid, and had opened spontaneously. On examination the external meatus was found to be filled with polypi. In probing the fistulous opening over the mastoid process, a fistula in the bone with rough walls was discovered. No communication found with the auditory canal. There were febrile symptoms and severe pains. On June 24th the bony fistula was enlarged under chloroform. After about six weeks, cure with a deeply depressed cicatrix. More than a year later the patient returned for treatment. Fever, acute pain, and swelling in the mastoid region had developed. The swelling soon terminated in an abscess. On August 10, 1883, a second operation.

Chiselling, removal of granulations with the spoon, and of cheesy masses from the mastoid cavity with the tympanum-tube. General condition at once improved. The healing process was very slow. In the middle of November there remained a large fistula opening directly behind the attachment of the auricle, extending one half *cm.* into the bone and completely cicatrized. No discharge whatever from the middle ear.

CASE 11.—Chronic Suppuration of the Middle Ear. Formation of Fistula in the Mastoid. Enlargement with Chisel. Clearing with Spoon. Cure in 6 Months.

Karl Krause, æt. two. Healthy child. At the age of one year, without previous otorrhœa, a large swelling developed in the region of the left mastoid process. In the Augusta hospital an operation on the mastoid was undertaken in August, 1882, which was followed by a decided improvement in the patient's already much debilitated general condition. The wound did not heal. The mother noticed that the ear began to run after the operation. In January, 1883, another marked swelling showed itself behind the mastoid process, so that on the 25th of January the patient came to the Policlinic. The fistula behind the ear communicated with the auditory canal, as shown by the probe. The canal was much swollen, filled with granulations. The entire mastoid region was the seat of an inflammatory swelling. On January 31st the fistula was enlarged under chloroform, and the granulations removed with the sharp spoon. In a few weeks the wound closed, but opened again repeatedly, till iodoform was dusted in, when a rapid and permanent closure was obtained. After the healing process was complete there was a deep depression on the posterior wall of the auditory canal. The drum membrane was entirely preserved but showed a uniform whitish opacity. Hearing does not seem to have suffered. The hearing was perfect at an examination made in the middle of February, 1884.

CASE 12.—Chronic Left-sided Suppuration of the Middle Ear with Formation of Polypi and Caries, Discharge of the Necrosed Malleus, Facial Paresis, Meningitic Symptoms. Enlargement of a Fistula, Clearing of the Cavity with the Spoon. Death 8 Days after Operation.

Selma Balzer, aged one year ten months, came to the Policlinic for treatment on March 30, 1883. It was stated that the left-sided otorrhœa had followed vaccination. In the beginning of

October, an abscess had formed behind the ear, and an operation was done for it in the Lazarus Hospital. The child remained in the hospital two months, the opening behind the ear not healing. Toward the end of December the child was again admitted to the hospital but now only poultices were employed. The opening was covered with adhesive plaster and the child, it is stated, was discharged as cured. After the removal of the plaster there was a continued discharge of pus from the fistula. When the patient came under our treatment on March 30th, there was slight facial paresis, the child was very restless, cried much, particularly at night-time, vomited repeatedly, had a poor appetite. The inner half of the auditory canal was filled with granulations, after the removal of which a small stream of fluid could be passed from the fistula of the mastoid into the auditory canal. While syringing on April 2d, the carious head of the hammer came away. The symptoms improved temporarily, to become soon worse again, the facial paresis being more marked, so that on April 6th, the fistula was laid open, the outer table of the mastoid removed with a chisel, and the cavity emptied of a large mass of granulations with the sharp spoon. Despite all this, marked meningitic symptoms developed, convulsions supervened, the child became comatose and on the 15th died.

CASE 13.—Chronic Suppuration of the Middle Ear, with Formation of Fistula in the Mastoid Process, Masses of Polypi of Fourteen Years' Standing in the Auditory Canal and in the Mastoid, Projecting from the Fistula in the Latter. Enlargement of the Fistula with the Chisel, Removal of the Polypi with the Snare and Spoon. Treatment Discontinued before Completion of Cure.

Matthias Teuchner, from Schwetitzkan in Posen, saddler, æt. nineteen. Came to Policlinic for treatment May 2, 1883. When five years old an abscess formed over the mastoid process as the result of inflammation of the left ear; the abscess was opened by a barber; the wound did not heal. Next year he went under regular medical treatment for over a year; and it seems that even at that time polypi were removed from the ear. Four years ago the patient was in Breslau under medical care, again two years ago in Lissa for a longer time without any alteration in his condition.

On examination the auditory canal was found filled to its mouth with numerous large polypi; one half *cm.* behind the line of attachment of the auricle was a cicatrized opening the size of a

goose-quill, from which projected a polypus the size of a bean. After the removal of such polypi as could be reached in the fistula and in the auditory canal with the snare, a large vertical incision was made under chloroform through the fistulous opening and a broad canal carried into the cavity of the mastoid process. By the aid of the snare and sharp spoon a great number of granulations were removed from the cavity. The introduction of a thick rubber tube kept the canal open for the time, so that free inspection was possible. During the after-treatment, fresh granulations had frequently to be removed with the snare and spoon. Meanwhile the size of the cavity diminished, so that it was to be hoped that things would progress to a perfect cure. When in the beginning of July I was obliged to leave Berlin, the patient declined further treatment, so with regard to the further progress of the case no information can be had.

CASE 14.—Chronic Suppuration of the Middle Ear with Formation of Fistula in the Mastoid Process. Enlargement of the Fistula with the Chisel. Removal of Cheesy and Cholesteatomatous Masses. Cure in 10 Weeks.

Kadack, turner, æt. twenty. When two years old contracted an otorrhœa after scarlet-fever and measles. The discharge from the ear has been incessant. There was no pain till his fifteenth year. About this time an abscess developed behind the right ear, with fever and severe pain, and was incised by the physician in attendance. The opening healed in four weeks. After two years the cicatrix broke down and since then he has had a fistula discharging pus in small amount. On January 19, 1883, the patient came for treatment to the Policlinic with distressing pain behind the ear and in the neck, marked deafness, profuse discharge of pus from the auditory canal and the fistula, sleepless nights and general malaise. On examination the external meatus on the right side was much narrowed at its inner half by a decided projection of the posterior wall. Cheesy and membranous masses were removed with difficulty from the depth by the aid of the syringe and hooked probe. On January 21st the fistula was laid open under chloroform, the corticalis chiselled away and now a large quantity of pus and cholesteatomatous masses were removed from the cavity in the mastoid and from the tympanic cavity. There was free communication between the cavity in the mastoid and the auditory canal. Iodoform was dusted on the

wound. A rubber tube was inserted for some days, then one of lead. The pains disappeared after the operation and did not return. For six weeks patient was unable to work. After resuming work he carried the lead tube for four weeks till the canal became very small and the discharge was reduced to a minimum. After the closure of the fistula the drum cavity was repeatedly cleansed by the aid of the tympanum-tube, without, however, bringing away any quantity of secretion. Although the drum membrane in the other ear was destroyed and there was marked deafness the patient was called into the military service last autumn. After three weeks spent in the hospital he was dismissed as unfit for service. In January, of the present year, he again presented himself to us; the discharge was trifling, the pains had not returned.

Having now communicated the cases operated during the last year I would take the liberty to present a short general review of my practical experience, utilizing also my former observations.

So far as concerns the choice of the point of operation I would lay down this principle:

The incision of the skin and the opening of the bone should be practised at the line of attachment of the auricle or, at least, immediately behind it.

In two cases (1 and 2) of the entire number the operation was performed on the healthy surface of the mastoid process. In both cases the skin incision was made at the line of attachment of the auricle and the mastoid was opened directly beneath this. In both cases the collection of pus was reached at a trifling depth. In the other cases with formation of fistulas it likewise proved most judicious so to incise the skin that the bone beneath the line of attachment of the auricle or immediately behind it should come into the region attacked by the chisel. It did not seem advisable to carry the operation-canal further backward on account of the danger of injuring the transverse sinus. According to the results of examinations of the cadaver already communicated by me,¹ and which are essentially in accord with those of Bezold and others, a sharp forward curve of the

¹ *Langenbeck's Archiv für Chirurgie*, Bd. xxi.

transverse sinus toward the posterior wall of the auditory canal is very frequent. In 100 temporal bones, the shortest distance between the sigmoid fossa and the posterior wall of the auditory canal, amounted in forty-one cases to 1 *cm.* or less, in one case to 5 *mm.*, in five cases to 6 *mm.*, and in six cases to 7 *mm.* The average distance was 11.5 *mm.*, the maximum 19 *mm.* The danger of wounding the transverse sinus is best seen on horizontal sections, such as I have shown in my work on "Diseases of the Ear, etc."¹

As we can not foretell whether we shall, in operating, chance upon a sharp curve of the transverse sinus, such a possibility should always be borne in mind. Those who are familiar with the anatomical relations of the parts, will, therefore, avoid the use of drills or trephines, such as are employed by many physicians. When, in using such an instrument, the sinus is chanced upon, an injury to it is inevitable, whereas, in the operation with the chisel, as the ground is kept clear for inspection, we can recognize the danger in time and avoid it. In the operation, special attention should be paid to the fact that the more the sinus projects forward, so much the nearer does it approach the external surface of the bone. To this I have previously drawn attention. Accordingly when a sinus is markedly curved forward we reach it at a trifling depth.

As for the danger of penetrating into the middle cranial fossa, I hold to the principle previously laid down by me, that the operation-canal should not extend higher than the level of the upper wall of the auditory canal. My anatomical investigations have shown that the floor of the middle cranial fossa is not infrequently separated from the upper wall of the auditory canal by only a thin bony lamella, and lies but a little above it, which state of affairs I have described as the low position (*Tiefstand*) of the middle cranial fossa. When I operated on the cadaver after the manner of Buck (*ARCH. OF OPHTHAL. AND OTOL.*, vol. III, p. 212), who sets the drill a little above the line of the external canal and penetrates inward, and a little upward and forward, I

¹Second edition, p. 117.

penetrated the middle cranial fossa with the drill in three cases out of one hundred.

In operating, the skin incision and the bony canal should be made so large that a free inspection of the wound-cavity may be possible during the after-treatment. In this way it becomes easy to remove pieces of bone which become detached later. Moreover we can (and I consider this of the utmost importance for a complete and permanent cure) remove remaining or luxuriant granulations with the sharp spoon or with caustics. In order to maintain the passage open for after-treatment, rubber tubes are inserted immediately after the operation, to be replaced later by thick, and still later by thin, lead ones. These lead tubes can be easily prepared by rounding one end of a small piece of tube with the knife, and giving to the other end a funnel shape by splitting it and bending the two halves apart. The advantage of the lead tube over the lead nails is, that through the former the secretions can pass while by the latter their discharge is impeded.

The operation-canal must be kept patent until such time as the wound-cavity has diminished in size concentrically by the development of sound granulations. Soft granulations are removed as above mentioned, or are caused to shrink by cauterization with the nitrate of silver.

For complete removal of old retained secretions or cholesteatomatous masses in the mastoid process, we find it impossible in many cases to dispense with the inflexible tympanum-tube, which I have recommended for cleansing the drum cavity and its recesses.

To prevent inflammatory reaction after the operation, the covering of the walls of the cavity, and of the canal in the bone, with powdered iodoform has proved to me of most avail. In none of the operated cases did inflammatory reaction ensue. With the existence of acute symptoms before the operation, there followed in all cases an immediate recedence of the symptoms and a surprisingly rapid cure, which, I think, should be attributed to the employment of the iodoform.¹ Both fatal cases may be ex-

¹ In one of these operated cases, a patient with acute inflammation of the middle ear and involvement of the mastoid process, the mastoid was chiselled

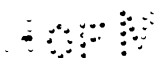
cluded from consideration here, as in these the operation was done at a stage of the disease when a favorable result was not to be counted on as the symptoms of cerebral disease had already developed.

In the use of the iodoform there is a circumstance upon which, possibly, the favorable effect of the remedy depends—namely, that the iodoform forms with the underlying tissues a soft, firmly attached crust; indeed, it is impossible to get a good view of the wound-cavity until after some days, when the crust has come away of itself or has been removed. By this crust-formation, on account of the scanty secretion, we can leave the first dressing unchanged for two or three days.

A strange observation particularly claims our attention in the above histories, the entire freedom from pain in cases 1 and 2 on enlarging the passage through the bone with hammer and chisel during the after-treatment. In both cases this was done with the patient sitting in a chair. In the second case it was necessary to chisel for half an hour in order to make the canal sufficiently wide and deep. This was done, to my great astonishment, with absolutely no pain.

When we consider, on the one hand, that the artificial opening of the mastoid process in acute, as well as in chronic, diseases leads to a prompt and perfect cure, and that the operation must be regarded as entirely free from danger; and on the other hand, the often very tedious, incomplete recoveries accompanied with severe functional disturbance, which now and then result from conservative treatment, we must decide in favor of the former plan; so much the more as under the conservative method there is always danger during its course of the extension of the disease deep into the mastoid. Again, in the chronic forms we are frequently unable to decide whether or not sequestra exist, which can only be removed by an operative procedure.

open on Feb. 10th, the perforation of the drum membrane had closed on the 13th, the lead tube was removed on the 18th, and on the 23d, the patient, at his own request, returned to work with a small superficial granulating wound.



CASE OF CHRONIC PURULENT INFLAMMATION
OF THE MIDDLE EAR GIVING RISE TO INTRA-
CRANIAL DISEASE—DOUBLE OPTIC NEURI-
TIS—PERFECT RECOVERY.

BY DR. JOHN F. FULTON, OF ST. PAUL, MINN.

UNDER what condition the mastoid process should be opened is by no means a settled question. Although the progress of otology during the last few decades enables us to decide the question with much greater precision than could have been done a few years ago ; yet it happens quite frequently that cases of middle-ear trouble come under our observation whose symptoms are so obscure and ambiguous that the best otologists will disagree as to the propriety of trephining the mastoid. This being a question of such great practical importance, the most experienced aurist will not fail to welcome the report of all cases which throw any light on the subject. When disease of the middle ear extends to the mastoid cavity it always excites our serious apprehensions, but when it extends to the cranial cavity it becomes so grave that but few cases of recovery have been reported, and with some of those the diagnosis is doubtful. Recent clinical reports however, show that intracranial disease as the result of chronic suppurative inflammation of the middle ear is not so rare as was at one time supposed, and that such cases are not absolutely hopeless. The following case which I report at the request of Dr. Knapp, and to whose skilful and conservative measures its successful termination is largely due, while it illustrates some of the subjects hinted at above, will be interesting and instructive, I hope, to my professional brethren, as it has been

to those under whose observation it has come. It gave me much anxiety on account of the obscure nature of the symptoms, and the different opinions given by the various specialists whom the patient consulted as to the proper means to be resorted to for the relief of this very dangerous malady.

Mr. J. H. Hiland, of this city, first came under my care on the 10th of May, 1883. He gave me the following history of his case: In 1877 some hardened wax was removed from his R ear by means of an instrument; his ear bled somewhat at the time. This was followed by a severe acute inflammation of the middle ear with considerable discharge. For this trouble he was treated by Dr. Francis Atwood, of this city. Not appreciating the danger of the suppurating process, the patient neglected himself, and allowed the disease to continue for a year. In 1878 he put himself under the care of Dr. Bartlett, of Milwaukee, who removed a polypus from the ear, and also succeeded in stopping the discharge in six weeks. After this the acuteness of hearing remained good and he had no more trouble until April, 1883, when the ear began to discharge again after he had suffered with pain for a few hours. At the time of my first examination I made notes as follows: Mr. H., aged thirty-six, a prominent railroad official. He was pale, and had an anxious expression. Has trouble in fixing his mind on his business. The canal filled with a whitish inoffensive discharge, which was carefully removed by means of absorbent cotton. The epithelium of the external canal was macerated and swollen, so that it was difficult to study the condition of the drum. Perforation of the upper posterior quadrant. It was quite red, as well as the adjacent part of the external canal. The perforation of the membrana tympani as well as the tympanum was the seat of granulations. The watch could be heard only on contact, and the tuning-fork heard best on the R side. There was nothing abnormal about the mastoid region or the glands or muscles of the neck. He was careless as to his treatment, reported at the office only a few times, and I heard nothing more of him until he returned from Dr. Bartlett, of Milwaukee, having been under his care one month.

He came under my care again on the 25th of August. The trip on the cars made him much worse. Travelling on the cars always had this effect. He travelled quite frequently to Chicago, St. Louis, etc., during the next six weeks, and always re-

turned with a relapse of his aural trouble. At this time (the 25th) I found the tissues of the external canal much swollen; the auricle stood out from the head. Some swelling in front of the tragus. There was no trouble with the mastoid or with the sterno-cleido-mastoid region. He was suffering considerable pain about the ear. I treated these acute symptoms by washing out the ear with a saturated solution of boracic acid and the instillation of atropia and morphia to relieve the pain. After a few days the swelling had subsided, and I began treating him with the boracic powder (prepared by Wyeth & Bro.) in the usual way, the canal being carefully cleansed before each application with the absorbent cotton. No syringing was allowed. Each application of the powder was followed by marked increase of the discharge and decided reaction. The patient remarked that other aurists had had the same experience, and he rebelled against its use. I then resorted to burnt alum and iodoform as recommended by Dr. Buck. It was applied directly to the granulations in the tympanum. This treatment diminished the discharge, and at times the patient seemed perfectly cured; but he was very careless—a hard worker and quite ambitious—so it was impossible to keep him under control. Pain annoyed the patient quite frequently; it extended nearly along to the region of the R. eye and frontal sinus. It was *always* relieved by cleansing the ear. The patient noticed this, so that he would come to my office to have the secretions removed whenever he suffered pain. His general health began to fail, and he complained that it was not easy for him to fix his mind on his business. During the latter part of September he showed marked signs of rapid improvement. He made his last visit before his acute illness on the 25th. The discharge had ceased; he suffered no pain; was buoyant in spirits; his trouble seemed to be at an end.

On the evening of September 30th I received a message to call and see him at the earliest possible moment. I found that he had taken a drive in a strong bleak wind without an overcoat, and had neglected to put the cotton in his ear that he was in the habit of using. He was suffering great pain, which was referred to the R. eye; the conjunctiva of this eye was injected and there was some lachrymation. I filled the external canal with hot water, and ordered this to be repeated a number of times, and prescribed morphia to relieve the pain. This symptom was removed in a few hours, and *never returned during his acute trouble.*

Oct. 1st.—Nausea and vomiting had started in during the night. Temp., $103\frac{1}{2}^{\circ}$; pulse, 100; a well marked *hectic flush* of the left cheek. The mastoid and sterno-cleido-mastoid regions perfectly normal. Although most carefully examined many times, there was never any redness or tenderness or swelling of this region. The most painstaking investigation failed to detect any evidence of dead bone. I enlarged the opening in the ear drum, and passed a delicate probe in all directions, but with negative results. Dr. Hand, of this city, was called in consultation, and took charge of the constitutional trouble. Bromide, aconite, and quinine were ordered.

Towels run out of boiling hot water were frequently applied to the ear in the hope of re-establishing the discharges, and it was washed out with carbolized hot water.

Oct. 2d.—Dr. Hand, Dr. Chas. Smith, and myself in consultation. It was the opinion of all that operative interference was not indicated, and to continue the expectant treatment. The patient was extremely low. Nothing could be kept on the stomach, so stimulant and nutrient enemata were ordered. These were continued for several days. The temperature $105\frac{1}{4}^{\circ}$, pulse 120. Hectic flush well marked, No pain or any symptoms referred to the ear. Several times during the afternoon the patient complained of "chilly sensation," *but there never was a marked rigor*. I was called a number of times through the day to see the patient by the anxious wife, saying that "he was going into a stupor." I found him somewhat lethargic, but he could always be aroused, and then would always give intelligent answers.

Oct. 3d.—On the morning of this day the case seemed most hopeless. Temp., $104\frac{1}{2}^{\circ}$. The shallow labored respiration; the rapid, feeble pulse; the deep, hectic flush; the cold, clammy extremities, all indicated that the end was not far off. We gave a most unfavorable prognosis. No new ear symptoms, except that a slight discharge showed itself. Some small lumps of mucous and epithelium removed; no odor, no pus. Treatment continued. Patient was supported as much as possible by stimulating enemata. On making my usual visit during the afternoon I thought I detected very slight abnormal tenderness behind the auricle, and the advisability of opening the mastoid was seriously thought of, but every thing seemed dark, so it was decided "to cast anchor and wait for more light." The morning came, and with it the light.

Oct. 4th.—The patient seemed to have taken a turn for the

better. The discharge was more profuse and slightly offensive. The succulent mucous membrane of the middle ear projected through the opening of the drum, and there was marked pulsation of these tissues, which continued for several days. The stomach began to retain food. The temperature had gone down to $102\frac{1}{4}^{\circ}$.

Yet the patient was by no means out of danger ; his condition was quite critical, and the question of opening the mastoid still debatable ground. So Dr. Jones of Chicago was called in consultation. He arrived on the following morning, Oct. 5th. He made a most careful examination. He agreed fully with the attending physicians in carrying out the expectant treatment, and did not favor opening the mastoid. He made some valuable suggestions as to the local treatment, such as the injection of astringent and antiseptic solutions into the ear, and the application of cantharideal collodion behind the ear. From this time on the convalescence of our patient was perfectly satisfactory.

The nausea and vomiting ceased : very little if any headache ; and the temperature came down to normal. Some dizziness. The digestion became good, and strength returned rapidly. In a few days I began the use of alcohol (95 %), to contract the flabby skin of the external canal, and the relaxed mucous membrane of the tympanum. It had the desired effect. The discharge ceased nearly altogether. Only a slight amount of moisture could be found in the canal at his morning visits. There was considerable tenderness of the bony portion of the canal, which had existed for some weeks, there being a periostitis of the part. It remained abnormally red up to time that Mr. H. started for Chicago and New York. The optic-neuritis, which will be described further on by Dr. Knapp, was first noticed on the 5th of October, for which trouble he was taking iodide of potash. This was the only form of eye trouble noticed. No dilatation or contraction of pupils. No ptosis. No strabismus at any stage of the disease. The patient was subject to attacks of acute pharyngitis, for which I ordered an astringent spray. I ordered him South to spend the winter, fearing that our winter would be too severe for him.

He was called to Chicago on important business, and left St. Paul Oct. 25th. Before going South I asked him to consult some of the New York specialists. He reported at Dr. Knapp's office Oct. 25th, from which date Dr. K. has kindly sent me his notes, viz.:

"Oct. 24, 1883.—I found him a robust man, with a slightly yel-

lowish complexion; the expression of his countenance indicating exhaustion and mental depression. There was no abnormality in the mastoid region, nor in the skin or muscles of the neck. There was moderate purulent, inoffensive discharge from the right ear. The watch was heard on application to the ear and bone, ordinary voice at the distance of 10' ($V = \frac{1}{8}$). The tuning-fork test was normal. The innermost portion of the posterior wall of the auditory canal was red, bulging, hard in its anterior and boggy in its posterior part, tender everywhere when touched with a probe. The membrana tympani was perforated in its posterior part; the mucous membrane of the drum cavity succulent, but not projecting through the perforation in the drumhead. The *Mt* of the left ear was slightly red in the region of the folds and handle. $h = \frac{1}{8}$; $V = \frac{3}{8}$. Catarrhal swelling of naso-pharyngeal mucous membrane.

"The ophthalmoscope revealed distinct optic-neuritis in both eyes, more pronounced in the left than in the right. It was more marked in this case than in any other that I have seen, consecutive to ear disease. The disks were swollen, reddish-white, with white radiating streaks. The swelling encroached $\frac{1}{4}$ P. D. (papillæ diameter) on the adjacent retina, and then fell abruptly—the regular choked disk. $S = \frac{3}{8}$ and F complete on both sides. The patient complained of pain over the whole right side of his head, and a tendency to dizziness. His pulse and temperature were normal. I ordered him rest, instillations of warm boracic-acid water, gentle syringing of the ear with the same solution three times daily, wiping the ear with absorbent cotton, and filling it with impalpable boracic acid-powder after each syringing; alum gargle.

"*Nov. 2d.*—Patient has felt tolerably well. The whitish discoloration and swelling of the optic disks have diminished. Treatment continued.

"*Nov. 5th.*—Was nauseated once after eating hot cakes.

"Prescribed instillations of an over-saturated solution of boracic acid in a fifty-per-cent. solution of alcohol, to diminish the discharge and contract the skin at the inner end of the auditory canal and the mucous membrane in the drum cavity.

"During the next fortnight the condition of the patient varied. There was dizziness occasionally, and pain in the right side of the head quite frequently. The mastoid region was neither swollen nor tender to the touch. The bulging of the posterior-innermost

part of the ear-canal persisted, and was, at times, even more marked than when I first saw the patient. In one place, a small hard point was felt by pressing with the probe on the bulging skin, as if a small piece of bone were projecting. Politzer's inflation doubtful. On catheterization, a dry sound was heard, no air escaping, yet the posterior upper part of drumhead was moist, and, with a probe, the bone was readily felt through a thin layer of very soft tissue. Optic-neuritis in both eyes slowly but steadily diminishing. Pharyngeal mucous membrane less swollen and red.

"My opinion was, that there had been severe purulent otitis media, with extension to the mastoid cells and perforation of the inner and anterior surface of the bone, the pus penetrating into the cranial cavity and escaping through the tympanic cavity, possibly also through a perforation in the posterior wall of the auditory canal. Symptoms of thrombosis and pyæmia being absent, the general condition of the patient, and especially the optic-neuritis, being improving, I did not think an opening of the mastoid to be imperatively indicated. Yet the presence of optic-neuritis, the more or less constant headache, and the occasional spells of dizziness and nausea, clearly indicated that mastoiditis interna was still present, and that the inflammation had extended into the cranial cavity. I decided to incise the bulging part of the posterior wall of the meatus, and with a sharp spoon scrape the surface of the bone, in order to remove necrosed particles or to establish or dilate a communication with the mastoid antrum, if the bone should prove carious. As the case, however, was still critical, and it was questionable whether opening the mastoid immediately behind the auricle would not be the safest and most efficient treatment, I asked the patient to obtain the opinions of Drs. C. J. Kipp and C. R. Agnew. Both physicians examined the patient carefully, and each of them sent me a written opinion, which not materially differed from my own.

"*Nov. 20th.*—I incised the bulging soft parts of the posterior wall of the auditory canal, and scraped the bone with a sharp spoon. Some pus was liberated, but the bone was neither rough

nor soft. I ordered the ear to be cleansed several times daily with a one-half-per-cent solution of carbonate of soda and protected with absorbent cotton.

"No special reaction followed the operation. The patient gradually felt better. The discharge ceased. Headache, some dizziness, and a feeling of lightness in the head occurred still on certain days, while on others he was completely free from them. Rest and strict diet always had a good effect on his condition, whereas imprudence, bodily exertion, and even driving in a closed carriage, were mostly followed by a return of the above symptoms. I was encouraged to continue the mild, more or less expectant, treatment of the case, and decided to abstain from further and more extensive operative interference, chiefly by the improvement of one symptom—the steady diminution of the optic neuritis. Only once during all the time the patient was under my observation, I found the neuro-retinitis worse, that was the day after a ride, unusually bodily exercise, and some indulgence at the dinner-table.

"At the beginning of December the recovery had so far progressed that the patient could fairly be thought convalescent and out of danger. Yet, to avoid a relapse, I advised him not to stay in New York any longer, much less to return to the severe winter climate of his home, but to spend one or several months in a Southern State. On the 10th of Dec., 1883, he left for Aiken, S. C., showing the following condition :

"Pharynx almost normal. Pulse 68, Temp. normal. At times still some dizziness ; slight pain in side and back of head. Appetite and general condition good. Ear-canal narrow, posterior wall still bulging, some swelling also in superior and anterior walls, $R \frac{1}{2}$, $L \frac{1}{4}$; Tuning-fork normal, from vertex stronger on right than on left side. $V R \frac{3}{8}$, $L \frac{3}{8}$. Politzer doubtful. Catheter gives a dry inflation sound. Optic disks almost normal. Acuteness and field of vision normal.

"*Jan. 22, 1884.*—The patient came again to New York to consult me. He looked healthy and cheerful, and was greatly pleased with the progress of his convalescence in Aiken. Yet, he was not cured. The discharge had ceased a week after he had left New York. His appetite and sleep were good, but of late he had had some headache, chiefly on the vertex ; some dizziness and nausea every now and then, and even for five or ten minutes at times a feeling of weakness in his limbs. The posterior part of the meatus

still prominent, with a point feeling like cartilage when pressed upon. The relief and color of the *Mt* are fairly normal, except in the posterior-upper part, where there is a depression from a former perforation. The ear-canal is of normal width, not tender to the touch in any place. Lower part of bony portion red, $h = \frac{1}{2}$, $V = \frac{3}{8}$. Left ear, $h = \frac{1}{2}$, $V = \frac{3}{8}$. *Mt* normal. Tuning-fork from forehead normal in both ears. Acuteness of vision $\frac{3}{8}$ in each eye. The optic-neuritis has disappeared, the arteries are small, but the optic disks not white.

"I advised the patient to return to Aiken and complete his recovery before he returned to his business—railroad work in St. Paul. He did so, and about two months later I learned from Dr. Fulton that he had returned perfectly cured. H. K."

Mr. H. returned to St. Paul on the 21st of March, and came to consult me on the 22d. He had continued to improve as long as he remained in the South, and felt so well that he could not stay away from his work any longer. He gained much flesh; was strong, well, and happy. Had taken a slight cold on his journey home which showed itself in the form of a mild pharyngitis; this soon yielded to an astringent spray. He had no pain except after being fatigued; there was a sense of weight referred to the occipital region. He had used his eyes a great deal for reading, but suffered no especial inconvenience; S, both eyes, $\frac{3}{8}$. The ophthalmoscope showed that the optic-neuritis had disappeared completely, the outlines of the disk perfect, no evidence of atrophy. I found the *R.* ear in the following condition: No swelling of the walls of the canal and no tenderness. The dizziness and pain have disappeared. The upper part of drumhead still depressed, and this depressed part is red, otherwise this membrane is normal. Acuteness of hearing $\frac{1}{2}$. Tuning-fork heard still better on this side. His ear is in the same condition at present.

I allowed the patient to return to work in a few days after returning home. He came again in a few days much alarmed about himself. He had lost confidence in his mental capacity. He feared to talk to his friends, thinking that they would detect his "mental weakness." These thoughts seemed to depress and discourage him deeply. He avoided his R. R. associates fearing that his mental infirmities would be detected and it would injure his standing. I never knew a man more keenly sensitive on any subject. This continued for some time so we feared that it would

not be possible for him to continue his work. I assured him that the trouble was only functional and no indication of organic trouble. Finally he regained confidence in himself, increased his work from day to day. I find that he is now able to do as much work as ever. His general health is perfect, and his ear gives him no trouble. He has received no treatment since his return except now and then an inflation of the ear. Thus terminates in a most satisfactory manner the history of a most remarkable case.

Remarks.—It is not likely that those who follow the clinical history will fully appreciate its embarrassing and doubtful features. It is extremely humiliating to think that you have neglected to perform your surgical duty in any case. The great question to be decided in this case was: Should the mastoid be opened? Would that have been a safe or justifiable operation with the obscure symptoms met with? My answer to the question was in the negative, after having carefully analyzed all the symptoms and the condition of the patient. Only at one time in the history of the case was there any indication of a septic accident, at which time it was feared that there might be a hidden point of suppuration some place in the temporal bone but that it was impossible to diagnose its location. It was also quite evident that the inflammatory process had reached the cranial cavity and had most probably started up a basilar meningitis. It did not seem to me likely that the disease had extended through the mastoid, but through other channels. With this diagnosis it was not clear how any operative procedure could do any good. Another reason for withholding the knife was the fact that pain never was a prominent symptom. It showed itself during the first few hours of the acute illness, but was relieved by a few simple remedies, after which it annoyed us no more while under my care. At no time in the history of the case could I detect any evidence of dead bone. Certainly there was no indication for operating up to the time of the acute illness. I looked upon it as nothing more than an obstinate case of chronic otorrhœa, and that the prolongation of the suppurating process was due to the imprudence of the patient and to hidden granulations in the recesses of the tympanum.

After the acute trouble started in (which was clearly due to exposure), the obscurity of the symptoms, the great prostration of the patient, and the fact that "we did not have good reason to believe that there was pus in the middle ear or mastoid, which could not find an exit by the external canal" (Roosa), led us to decide that the opening of the mastoid cavity was not demanded. I refer to these reasons somewhat in detail because the patient was told in New York that the operation should have been performed. The complete history of the case, together with its most happy termination, shows conclusively that the conservative treatment which he received both here and in New York, and that which was strongly advised by Dr. Jones, of Chicago, was the proper and correct treatment of his case.

Also worthy of note is the favorable influence of the climate of Aiken, S. C. The discharge *never ceased completely* until he went to this place. It stopped a few days after he arrived there and never returned. I doubt if it would have been possible to have completely cured the case in this climate. He went to several other places, such as Washington and New Orleans, but they did not agree with him nearly so well as Aiken. The subject of change of climate as a remedial agent in the treatment of aural troubles is one which I often think is too much neglected. I have frequently noticed that cases of chronic suppuration are very obstinate in our climate, while the chronic non-suppurative cases are often much improved by it.

ROUND-CELLED SARCOMA OF THE EAR.

By J. ORNE GREEN, M.D., OF BOSTON.

(With a wood-cut.)

F. P., aged twenty-three, male, entered the Boston City Hospital Nov. 29, 1882. For the earlier history of the case I am indebted to Dr. F. H. Hooper, who saw him at the dispensary one month before he entered the hospital. There had been an otorrhœa on the left side ever since scarlet-fever at six years of age, continuous and without acute exacerbations. When first seen there was muco-purulent discharge, and a spongy, very vascular, fleshy mass filling the left meatus; this mass seemed to be adherent to the walls of the meatus; there was but little pain. After a time pain came on in the mastoid, followed by redness and swelling of the integument, and he was advised to apply for admission to the hospital or infirmary. Some two weeks afterward he presented himself at the City Hospital.

The left auricle was pushed outward and forward by a diffuse swelling over the mastoid, which had ruptured, and from the opening protruded a mass of fungous granulations two inches in length and one in breadth, dotted with spots of sloughing-tissue, and bleeding freely on touching. The meatus was filled with the above-described fleshy mass, resembling a polypus attached to the posterior wall of the meatus. The general condition was very bad, the appearance cachectic, the patient anæmic and very weak. The pulse and temperature were but little above the normal. He was ordered iron, quinine, and stimulants, and a charcoal poultice.

During the next two days the temperature rose rapidly, and on Dec. 2d there was a severe chill, with great prostration. He was then etherized, the fungous granulations over the mastoid removed, and the swelling incised down to the bone, evacuating

a large amount of fluid and caseous pus. The bone was extensively softened, and with the gouge a large opening was made into the antrum mastoideum. The meatus was cleared from granulations and carious communications were found to exist between the meatus and mastoid. All parts of the petrous bone which could be examined, either from the mastoid or the meatus, were found carious. The bleeding, which was considerable, was readily controlled by pressure. Drainage-tubes were inserted, one into the tympanum through the meatus, and one into the antrum from the mastoid. Douching with carbolic solution, 1 to 60, was used daily.



In the course of forty-eight hours the temperature fell nearly to the normal, there were no further chills, and the pain was less. From this time there was no marked change till Dec. 11th, when the temperature rose from 99.4° F. in the evening of the 10th to 104.8° F. in the evening of the 11th, with severe frontal headache, dimness of sight, and marked chilly feeling, although no rigor. Calomel, gr. j. every two hours through the day, was followed by a free dejection and rapid improvement the next morning, but the same symptoms returned on the 15th, accompanied by lachrymation, profuse perspiration, great somnolence, pain in the eyes, and photophobia, with œdema of the left eyelids and left side of the

face. Three fourths of a grain of morphia were required at night. All of these symptoms passed away in a few days.

Dec. 21st, fluctuation appeared in front of the tragus, was incised, and sero-pus evacuated. Indurated glands were found in the cheek and neck. On the 22d, 24th, and 26th, there were chills, without distinct cause for them being discovered. On the 30th the skin all about the ear was breaking down, the mass over the mastoid was increasing rapidly in size, showed distinct nodular outgrowths, and exhibited no tendency to repair in any part. Dec. 31st and Jany. 1st, there were again chills, with a temperature of 106.7° F., and active delirium. At the same time there was a return of the appearances of the 15th, in the face, probably referable to further disease of the brain sinuses. All soon disappeared, but returned again on the 17th, when dysphagia was complained of. Feby. 26th, paralysis of the left facial was noticed, and continued through life.

The tumor had been increasing steadily in size, and was then estimated to be eight inches in length, six in breadth, and four in thickness over the mastoid; in addition, it extended below and in front of the auricle. After this report it continued to increase, and large masses sloughed away at different times, pieces as large as a hen's egg being cast off several times. Two or three times small arteries were opened, but the hemorrhage was readily controlled by pressure and iron. The treatment consisted in draining the deeper parts, antiseptic dressings, nourishment and stimulants, and morphine for the pain.

During April and May emaciation became extreme, and for the last few weeks he lay in a semi-comatose state, and finally died from exhaustion on May 21st.

No autopsy could be obtained, but a portion of the tumor was submitted to Dr. W. W. Gannett, Pathologist of the Hospital, for examination, and he reported as follows: "A section showed a smooth, homogeneous, flesh-like, slightly moist surface of a pale grayish color. Microscopically certain portions were made up of connective-tissue fibres, with here and there small collections of round cells. Other portions were much more cellular, being made up of round cells about twice the size of leucocytes, between which a small amount of connective tissue could be seen. The tumor is evidently a sarcoma of the round-celled variety."

Unfortunately, the primary origin of the malignant growth could not be determined, as when the patient was first seen the meatus, tympanum, and mastoid were all involved.

The case is of interest from the rarity of such growths in this situation.

A CASE OF FRACTURE OF THE EXTERNAL AUDITORY CANAL BY CONTRECOUP, WITH RUPTURE OF THE DRUMHEAD.

BY DR. CORNELIUS WILLIAMS, OF ST. PAUL, MINN.

FORMERLY ASSISTANT SURGEON TO THE OPHTHALMIC AND AURAL INSTITUTE OF NEW YORK.

On the 7th of Dec., 1883, I was called by Dr. Gottfried Stamm, of this city, to see F. K., æt. thirty-seven, who gave the following history, which was, however, only obtained after the lapse of several days, and partly from others.

On the night of the 5th of Dec., while walking on a slippery sidewalk, patient lost his footing and fell backward, striking the back of the head against the ice which covered the walk, with such force as to stun him. He lay for a time, it is not known how long, unconscious, and was carried home in a buggy by friends.

He doesn't recollect any thing of the fall except that his feet slipped from under him, and for several days did not so much as that. He remembers having vomited, and declared that some of the matter vomited, together with blood, came from the ear. It is stated by his landlady that when he was brought home his overcoat and the cushions of the buggy were covered with large quantities of blood. When I saw him, the bedding and especially the pillow presented the appearance as if a woman had just been confined there.

Present Condition.—Rational, complains of great pain in left side of head, pulse slow, temp. normal, the left ext. aud. canal is filled with clotted blood, which I removed by means of the forceps, cotton pellet, etc. While cleansing the canal with the cotton carrier and cotton, the pellet, as I withdrew it, was caught by what proved to be a splinter of bone which was not wholly detached, and protruded through the skin at an angle with the plane of the canal of about 45° . An examination revealed a stellate laceration

of the *Mt*, the handle of the malleus hung seemingly free, attached by its upper portion to the upper fragment of the membrane, and a ragged furrow in the skin extending outward along the junction of the anterior and inferior walls of the canal to the protruding splinter, which corresponded to the beginning of the bony canal. The hearing was now tested on that side, and it was found that the patient heard the tuning-fork in the air and when applied to the mastoid; with the heel of the fork applied to vertex, he heard it more distinctly on left side; watch not heard on contact. After demonstrating the fractured bone to Dr. Stamm I removed it in his presence by seizing and detaching it with a pair of forceps. It measured 4 mm. by 3 mm. at its broader end, tapering to a point, and was irregular in shape, had a smooth periosteal surface on one side, and the other rough. Dec. 8th, headache continuous, some sanguinolent discharge from ear, ordered ice-bag to side of head. Dec. 15th, Occlusion of canal by the consequent dermatitis and swelling. Dec. 18th, the swelling is subsiding, complained of occasional dizziness. Jan. 10, 1884, *Mt* still red and thickened, some slight discharge, skin where bone was removed and over the furrow described is raised, Hd., 2' for watch, some headache with dizziness whenever he looks up or stoops. Jan. 12th *Mt* entire, whiter, no discharge, Hd. 4', watch ($\frac{1}{8}$); complained of headache, dizziness, pains in occipital region. I delivered the patient into the hands of my friend Dr. Stamm, who ordered leeches to the mastoid and rest in bed.

It should have been noted that all along there was pain in the articulation of the left lower jaw, which gradually disappeared. The patient recovered and has only occasional attacks of dizziness.

That the patient in this case fell on the back of his head was indicated by his position when found, lying upon his back and by the fact that the back part of the brim of his stiff felt hat was broken off and lay under his head. The fracture probably extended into the Glaserian fissure, to the tympanum and farther, terminating only when it reached the foramen lacerum medium. It is not probable that any considerable injury was done to or within the labyrinth, but it is probable that there was concussion of the entire labyrinthian contents. There was localized pachymeningitis as indicated by the headache and pain in

temporal region. The impulse of a blow received upon the occiput will be transmitted to, and chiefly expended in, the region where we find the fracture in this case. This fracture may have occurred as the direct result of contrecoup in part or in whole, or it may, perhaps, have been produced by the recoil of the condyle of the jaw which had been driven forward and then forcibly drawn back by active muscular contraction. In this case the wound of the soft parts was not at right angles to the axis of the canal, but otherwise the case may be placed in the first category of Baudrimont's classification.¹

¹ These ARCHIVES, vol. xii., p. 348.

A CASE OF CRIES OF THE PETROUS PORTION OF THE TEMPORAL BONE, WITH FACIAL PARALYSIS AND FATAL HEMORRHAGE FROM THE CAROTID.

BY S. MOOS AND H. STEINBRÜGGE, OF HEIDELBERG.

Translated by Dr. CORNELIUS WILLIAMS, of St. Paul, Minn.

With notes of an analogous case, not accompanied by hemorrhage.

Clinical History.—A merchant, twenty-nine years of age, entered the service of Prof. Weil, Oct., '82. A year before he had typhoid fever, and he suffers since then with tinnitus on both sides. For some days, has had pain in the left ear, and, since Oct. 8th, the ear has run.

Present Condition.—There is so much swelling of the left external auditory canal, that only the upper half of the *Mt* is visible, which appears red and thickened. The perforation cannot be seen, but is manifested during Valsalva's experiment by an issue of air and secretion. Boracic-acid treatment.

During the course of the next month, a large perforation made its appearance in the posterior half of the membrane, together with great pain and profuse secretion. Boracic-acid having had no influence over the discharge, it was changed for a ten-per-cent. solution of acetate of lead, which was, however, not borne.

In the third week of December, the hearing on this side was entirely gone. Acoumeter, on the left side, 0; tuning-fork heard only on the right. The patient heard the voice, if spoken directly in the left ear, but probably heard with his right ear. Constant roaring on left. Patient sometimes complains of a "rumbling" as of a carriage, in the right ear. The *Mt*, on this side, is without light-reflex and somewhat opaque. Acoumeter heard at four

metres ; hearing, for speech near by, is good ; owing to the position of the bed, cannot be tested at a distance. The air-douche cannot be used because of the nose-bleed which is produced with each attempt.

The pain continued, and, in the next month, paralysis of the facial appeared, without implication, however, of the branches to the soft palate. The muscles remained responsive to the faradic current.

Membrana tympani is now entirely destroyed. Fluids injected into the ear pass through the Eustachian tube into the throat at once, and produce violent coughing and symptoms of strangulation. The opacity of the mucous membrane of the right *Mt* has much increased, and the patient complains a great deal of a sensation of stuffiness in that ear ; otherwise no change. General condition very bad.¹

Jan. 31, 1883.—Died from arterial hemorrhage from the right ear.

Autopsy, by Prof. J. ARNOLD.² *Extract from the autopsy-notes.*—*Left lung* closely adherent to the costal wall and to the diaphragm. Usual appearances of chronic pleuritis ; small cavities at the apex of the lung ; small nodules in the lung-tissue. *Right lung* same appearance, and, in addition, fresh infiltrations. Everywhere in the tissue of the serous membrane covering the small intestines, the cœcum, bladder, and rectum, tubercular nodules are found. The spleen is adherent to the diaphragm. Extensive loss of tissue of the mucous membrane in the lower part of the descending colon, as well as over the valve of Bauhin (ileo-cœcal).

The mucous membrane of the larynx pale everywhere, and ulcerated in some places ; both vocal cords reddened and swollen.

Macroscopical Examination of the Left Temporal Bone.

Mt entirely destroyed. Malleus gone ; incus is lying on the floor of the tympanum ; stapes preserved and movable. Mucous membrane of tympanum thickened and sclerosed. *The bony framework of the tympanic mouth of the tube is carious.* Particular attention is drawn to a *loss of substance* in the external *bony wall* of the carotid canal which

¹ With reference to the two cases of Eschle (*Deutsche med. Wochenschrift*, 1883), we wish to say that numerous examinations of the secretion removed from the external canal, for bacilli, gave a negative result.

² Whom we have to thank for the temporal bone.

measures 15 mm. in breadth and 7 mm. in height. The artery is bare to the whole extent of this opening and it is corroded and perforated near the promontory. The latter is bare of mucous membrane and periosteum with roughening of the bone—the same roughening of the bone is felt when the sound is made to touch the inner and lower wall of the canal of the carotid. Above the oval window the canal of the facial is carious and laid open to the extent of 2 mm. where the nerve is bare.

The mastoid process as well as the bony portion of the ext. aud. canal were sclerosed. The sclerosis was so complete in the mastoid that the thickness of the bone from without to the antrum measured 27 mm.

An examination of the labyrinth on this side was omitted in order to save the preparation, which was added to the collection of the ear-clinic.

Microscopic Examination of Facial and Acoustic Nerves.

In a piece of the facial nerve which had lain for seventy-two hours in a one-per-cent solution of osmic acid, and which had been chiselled out of the Fallopian canal just in front of its entrance into the stylo-mastoid foramen, we found the medulla to be remarkably granular. Broad fibrils alternated with smaller ones dark colored, tinged with gray. In the neurilemma a great many fat-granules—otherwise nothing abnormal.

The fibres of the acoustic treated in the same way were found to be much altered. Being teased or even pressed upon through the cover they separated into round or egg-shaped fragments. Where disintegration had not taken place these small bits could be seen ranged in beaded rows and held together by means of the axis-cylinder. The latter was very small but generally well preserved and even in the fragments still recognizable, often projecting for some distance beyond the margin of the fragment. The principal changes seemed to have taken place in the medulla which had everywhere suffered extensive shrinkage, extending even to the axis-cylinder, giving rise to the beaded appearance of the fibres and accounting for the disintegration

of the preparation. The fibres themselves were embedded in a thick matrix consisting of a number of fine grayish-yellow fibres with here and there small hyaline nodules, very similar to those we once observed in a case of acute degeneration of the acoustic nerve following hemorrhagic pachymeningitis.

We content ourselves with having demonstrated this condition without venturing upon an explanation of its significance, since no examination of the labyrinth was undertaken, as above mentioned.

REMARKS.

Aside from the intrinsic interest which this case possesses on account of the hemorrhage from the carotid, it is remarkable because of its rapidity of development—the entire process, caries and all, only occupied four months.

It is to the caries that must be attributed the continuous and severe pain which is quite wanting in many cases of purulent inflammation of the middle ear due to tuberculosis. We have here also a total destruction of the mastoid cells, but it is doubtful if such a marked sclerosis of the bone could develop in so short a time, as well as the caries; perhaps its origin dates from the typhoid fever from which the patient suffered a year ago.¹

Whether the question be decided one way or the other is of no practical importance and we may, as in a former case of caries of the temporal in which we made a dissection, again refer to the fact *that in cases in which we meet with unexpected difficulties in opening the cells of the mastoid, even when there is caries, we may, as often or oftener, be confronted with a sclerosis as with disorganization of this bone.*

With reference to this case and the critical remarks made by the distinguished authors, the translator may be permitted to add some details of a very similar case, unaccompanied, however, by hemorrhage, nor as yet followed by death.

On Dec. 6, '83, W. W., æt. sixty-five, baker, born in Germany, was sent to me by Dr. G. Stamm, of St. Paul. Patient has suf-

¹ This hypothesis is supported by the fact that upon the other side, on which there was no purulent process, the mastoid showed the same condition.

ferred since childhood with discharge from both ears, but has not experienced particular inconvenience until recently.

Present condition.—Moderately thin, but well nourished ; slight discharge from both ears. For some days has complained of intense pain in right side of head, referred chiefly to right temple and ear. Loud voice heard on both sides ; tuning-fork placed on vertex, heard in both ears, more pronounced in right. Ext. aud. canal on both sides much narrowed, only the posterior and upper part of the tympanic space can be seen. In the right ear there are a number of small polypi, which when removed with the snare reveal total destruction of *Mt* as far as can be seen. The probe, passed into the tympanum, is met by dead or bare bone, over all the post. wall of the middle ear which can be reached ; no force whatever was used nor any pain occasioned. Temp. 102° F., no optic neuritis. Patient states that he has had chills, with subsequent sweating, for two weeks. No tenderness or redness over mastoid. I cleansed the ear and dropped in warm alcohol. Ordered ice-bag to cover the temple.

Dec. 8th.—Advised to enter St. Joseph's Hospital, which he did. There is now facial paralysis ; tongue not deflected ; no paralysis of soft palate ; complains of great pain in right eye ; no objective condition of eye to account for it. I gave kal. iod. and ord. ice to be continued ; instil alcohol.

Dec. 9th.—There being some slight pain over mastoid, with the assistance of Dr. J. H. Murphy I made a free incision down through the periosteum.

Dec. 10th.—Less pain ; temp. 102° F.

Dec. 11th.—Temp. normal ; more discharge from ear.

Dec. 12th.—Temp. 101°. Some cough, and deep râles over posterior part of chest ; friction-sound over posterior sup. part of left lung.

Dec. 13th. to 16th.—Feels much better. Some discharge from incision.

Dec. 17th.—Pain in side of head same as before ; throbbing constant pain in right eye. The temp. again went down on the 19th, and for several days patient considered himself well enough to leave the hospital. Ice has been continued almost uninterruptedly since entering hospital. An attempt to do without it was immediately followed by pain, which was lessened by its re-application.

Jan. 9, '84.—The pain over the right eye and in the eye is

intolerable ; severe pain in region of the ear ; facial paralysis unchanged ; drooping of upper lid ; very great dryness of the right nostril has existed for a week ; he complains of disagreeable taste in mouth ; has had for some days sensation of fluttering and snapping on right side of forehead. The outline of the right optic disc is not entirely clear, but there are extensive corneal nebulæ ; neuritis cannot be made out ; patient sees as well as ever. There being some pain over mastoid, I proposed an operation, as I had several times before, but it was declined. On the 13th the patient left the hospital. His general condition was much better than when he entered. No fever, chills, or sweating. He afterward entered a hospital in a neighboring city and remained for six weeks. His condition is said to be about the same as when he left St. Joseph's.

The condition which I diagnosticated was caries of the post. wall of the tympanum involving the canal of the facial, the caries probably not very extensive, localized pachymeningitis, a low form of sinus-phlebitis, with perhaps the formation of an incomplete thrombus of one or both of the petrosal sinuses. The labyrinth does not seem to be involved as yet. There are all the evidences of extensive sclerosis of the mastoid.

The good result which often comes from incisions through the periosteum of an inflamed bone, or better yet when a portion of an inflamed or sclerosed bone is removed by means of the chisel or drill, is so marked, so unmistakable, that I consider it the duty of the surgeon to operate in this and all similar cases where an opportunity is offered. There is always the possibility that, in opening the mastoid antrum in such cases as this, cholesteatomatous masses or necrosed bone may be revealed and removed ; that even if nothing else might come from such a proceeding, it would be quite justifiable. A carious process of a portion of the temporal bone, which, if it go on, will result in fatal intracranial complication, or, as in the most instructive case here given, fatal hemorrhage from the carotid, may, by a timely removal of a piece of the mastoid, opening the antrum or not, in some cases be arrested and life saved. If this much be admitted, then the operation should be done in all

cases where an osteitis, or caries of any portion of the temporal is known to exist.

In this climate where mastoid and other complications of acute otitis media are especially prone to occur, we have frequent opportunities of verifying what I have just said, and my experience in several recent cases has confirmed me in the belief as to the great utility of operation upon the bone even though the antrum be not opened.

The following case will serve as a sample :

Nellie McG., twenty years old, had suffered since Jan. 20, '84, from acute otit. med. pur. Marked periostitis of mastoid.

Feb. 2d.—Wilde's incision made.

Feb. 29th.—Has had a number of chills and rigors ; tenderness and pain over mastoid have been renewed and are severe. The probe, passed into the incision, comes into what seems to be a sinus leading into the antrum.

March 1st.—Assisted by Dr. C. A. Wheaton I enlarged the old incision with the intention of enlarging also the fistula in the bone. It was found, however, that the swelling of the soft parts had led to a mistake as to the direction which the probe had taken, and that it had passed under the tip of a rather short mastoid process, and the roughness of the jagged bone had given a sensation as if the probe had entered a fissure in the bone. I then, with Buck's drill, trephined (at the suggestion of Dr. Wheaton, I myself being convinced that it should be done), just below the level of the superior wall of the ext. aud. canal, and $\frac{1}{4}$ of an inch behind it. Illuminating, with a laryngoscope mirror, the hole made by the drill, and clear-away the *debris* by means of a cotton carrier and absorbent cotton, I slowly and carefully penetrated to the depth of $\frac{3}{4}$ of an inch without coming upon either the mastoid cells, antrum, or the venous sinus. It was then thought best by both of us to stop. The bone at the bottom of the opening made by the drill was dense and bled but little (operating in this way I think there is less danger of opening the walls of the sinus than with the chisel).

Mar. 4th.—Doing well. No discharge from ear.

Mar. 7th.—Perforation closed ; can hear the watch. A silver drain-tube fixed in the opening into the bone.

Mar. 20th.—Hears watch at 6' ; removed tube ; has had no pain or chills since the day after operation.

April 10th.—Wound closed ; hears watch at 4'.

April 22d.—Hears watch at 5' ($\frac{4}{11}$).

Here the canal of the wound in the bone did not at any time communicate with the antrum or any cells which were not entirely obliterated. It is probable also that there was considerable sclerosis which had come about in less than two months. Immediate and permanent relief was given, which occurred only after the bone was perforated, and was not afforded by the Wilde's incision.

BOUGIEING THE EUSTACHIAN TUBES.

BY VON A. EITELBERG,

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DIMINUTION of the calibre of the Eustachian tubes can only be diagnosticated by means of very careful bougieing. It is true there is another method by which we may obtain important information as to the lumen of the tubes,—I mean the plan of A. Hartmann.¹ He measured manometrically the pressure force required to drive air through the Eustachian tubes into the middle ear. It is sometimes possible by this method to ascertain the situation of the obstruction.

In a given case if we thus employ, first, the method of Politzer, and then the catheter, and find less resistance to the entrance of air with the latter, we may conclude that the obstruction is in the pharyngeal part of the tube. The point of the catheter is presumed to have passed the place of constriction in the tube. Constrictions in the cartilaginous portion of the tube, however, particularly at the isthmus, are only to be appreciated by the introduction of bougies of varying calibre. In such cases the auscultation sounds are unreliable, for, according to the experience of Urbantschitsch,² a stricture of the tube is frequently de-

¹ "On the Functional Importance of the Eustachian Tubes." Leipzig, 1879.

² Bougieing the Eustachian tubes in chronic disease of the middle ear, especially in chronic middle ear catarrh. *Wiener med. Presse*, 1883, Nos. 1-3.

tected, especially at the isthmus, when the probe is employed, where, during catheterization, the air passed apparently without obstacle. In the light of these facts the criteria, as arranged by Rau,¹ for the recognition of changes of lumen of the tubes according to the auscultation sounds perceived, must be materially modified.

Urbantschitsch always advises, therefore, in diseases of the middle ear, and especially in chronic middle-ear catarrh, to bougie the Eustachian tubes, as symptoms may be thus accounted for that are not explained by an inspection of the membrane.

In a medico-legal sense the importance of examinations of the Eustachian tubes by means of the probe is well illustrated by a very recent case published by Bezold,² which concerned an individual who had received a stab-wound in the left ear, wounding the Eustachian tube of that side, and who testified in court to having acquired a marked degree of deafness as a consequence thereof, and upon which testimony the charge of supposed simulation and perjury was based, because the medical testimony for the State opposed the claim of the accused that the deafness claimed was due to the wound. Bezold, to whom the patient was referred for an expert examination of the ear, reported, sustaining the claim of the accused, with especial reference to the fact that "absolute impermeability of the tube existed for a powerful stream of compressed air, and that *a thin whalebone probe could be passed for 14 mm. beyond the end of the catheter into the tube, but there met an impassable obstruction.*"

According to Lincke,³ some forms of disease of the mucous membrane produce circular or unilateral narrowing, the existence of which may be recognized by the fact that a fine sound or a small catgut may be introduced as far as the obstruction and no farther, and when withdrawn from the tube will sometimes be found with the tip colored with blood.

¹ "Lehrbuch der Ohrenheilkunde." Berlin, 1856, pages 40, 41.

² A case of perforating wound of the organs of hearing in court, and subsequent indictment of the plaintiff for supposed simulation and perjury, *Berliner klin. Wochenschrift*, 1883, No. 40.

³ "Handbuch der theoretischen und practischen Ohrenheilkunde," Bd. ii., p. 463.

Among those who most zealously cultivated the employment of bougies for the Eustachian tubes in Germany was Kramer. He made use of bougies as a therapeutic agent in stricture of the tube, and also as a vehicle for the application of medicaments. He therefore recommended, in catarrhal inflammation of the tubes, with an exclusively submucous infiltration, the introduction of thin bougies ($\frac{1}{8}$ – $\frac{1}{4}$ mm.) which had been soaked in a solution of atropine or of nitrate of silver.¹

The bougieing of 163 Eustachian tubes in 100 individuals, the results of which forming as they do the subject of this paper, was not undertaken for the purpose of an examination as to the therapeutical value of that procedure, but to establish the frequency with which diminution, especially at the isthmus, of the calibre of the tubes occurs in the several diseases of the organ of hearing. The proposition to establish in the living the distance from the pharyngeal orifice of the tube to the isthmus by accurate measurement had to be given up for the following reasons. It is true that in very many cases one may be enabled to conclude, from the feeling of resistance encountered, that the tip of the bougie has entered the isthmus, and from the fact that by an increase of force the resistance is overcome, that the isthmus has been passed. Aside from the fact, however, that annular or even one-sided swelling in the cartilaginous portion of the tube may give rise to similar sensations, there occur at the isthmus depressions which may present a resistance to the passage of the probe identical with that offered by a stricture. On the other side cases are not so rare in which the largest bougie in use, $1\frac{1}{2}$ mm. in thickness, may be passed through the isthmus without the employment of unusual force. There is another condition which must also be considered here, as pointed out by Urbantschitsch (*l. c.*), to wit, we are not always able to control the extent to which the catheter enters the tube.

In order to obtain a little more light on this subject I instituted the series of experiments, as hereafter detailed, upon the cadaver, and ascertained that the penetration of

¹ "Handbuch der Ohrenheilkunde," Berlin, 1867, pp. 286 and 287.

the catheter amounted to from 6 to 11 *mm.* According to Kramer¹ the point of the catheter must lie about one line within the superior angle of the tube in order that a bougie may be introduced. Hyrtl² declares that the catheter cannot be introduced farther than three to four lines, *i. e.* 6 to 8 *mm.* in the Eustachian tube, because of its rapid diminution of calibre.

Tröltsch³ maintains that the tip of the catheter may be thrust for 10 *mm.* and even farther through the ostium pharyngeum. All this will vary however with the size, length, and curvature of the catheter used, as well as with the peculiarity of the tube operated upon.

The length of that section of the tube from the ostium pharyngeum to the isthmus is generally estimated at about 24 *mm.*, which nearly coincides with the fact.

The longest tube among fifteen *fresh* preparations which were measured by me, was 48 *mm.*, in which case the isthmus was 28 *mm.* from the pharyngeal orifice. In the following deductions I will assume it as established by the evidence adduced, that when the bougie has penetrated beyond the end of the catheter in the Eustachian tube to the extent of 24 *mm.*, that it has passed this isthmus.

The normal width of the isthmus is $1\frac{1}{2}$ to 2 *mm.*, though in individual cases it may exceed this. Kramer, *l. c.*, Tröltsch, *l. c.*, and others. Thus Huschke⁴ gave the height of the isthmus as $1\frac{1}{2}$ lines, and its breadth at $\frac{1}{4}$ to $\frac{1}{3}$ of a line. C. Lange⁵ says that the narrowest part of the tube, *ad maximo distended*, represents a double funnel and is passable for a sound of 2 to 3 *mm.* in diameter. In the living we may also conclude, from the ease with which a probe having a diameter of $1\frac{1}{2}$ *mm.* can be passed beyond the isthmus, that it has a very appreciable width. It should be mentioned here that, according to Schwartze,⁶ in sclerosis of

¹ *Loc. cit.*, page 5.

² "Handbuch der topographischen Anatomie," etc., 4 Auflage, Wien, 1860, I. Bd., pag. 254.

³ "Lehrbuch der Ohrenheilkunde," 7 Auflage, Leipzig, 1881, p. 380.

⁴ Th. v. Sömmering's "Lehre von den Eingeweiden und Sinnesorganen des menschlichen Körpers," Umgearbeitet und Vollendet von E. Huschke, Leipzig, 1844, p. 835.

⁵ "Lehrbuch der Anatomie des Menschen," Wien, 1865, p. 731.

⁶ Gehör-Organ im "Handbuch der pathologischen Anatomie," von Klebs, Berlin, 1878, 6. Lieferung, p. 106.

the mucous membrane of the tympanum an *acquired dilatation* of the whole length of the Eustachian tubes often occurs, so that the lumen of the canal may be increased to three or four times the normal. According to the same author, as a result of chronic purulent tympanitis, atrophy of the bony walls of the canal may ensue with resultant partial dilatation of that section.

According to Urbantschitsch, *l. c.*, where the isthmus still permits the passage of a sound having a diameter of $1\frac{1}{2}$ mm. without especial difficulty, there is no indication for treatment by means of bougies; for there is here no condition of the mucous membrane which would be favorably influenced by bougieing.

In my examinations I used the French filiform bougies à boule, of the diameter of $\frac{1}{8}$, $\frac{3}{8}$, $\frac{5}{8}$, and $\frac{7}{8}$ mm. (Nos. 1, 2, 3, and 4 Charrière's standard). For my purposes these sufficed; in practice, however, the intermediate Nos., $1\frac{1}{8}$, $2\frac{1}{8}$ and $3\frac{1}{8}$, will be needed. Neither did I observe the same order of succession which must be followed in treatment, but began at once with the largest size, passing to the next lower number if not successful in passing the isthmus with the first. In this manner much time was saved without in the least lessening the exactness of the result.

Before each introduction of the bougie assurance was obtained that the catheter was in proper position by forcing air through the catheter, and the act of bougieing was considered as successful if the catheter remained immovable while the patient coughed or spoke.

There are, of course, some cases where the tip of the catheter remains fixed in the mouth of the tube, or even in Rosenmüller's fossa without extraneous aid. These cases are, however, upon the whole, rare. Another confirmatory proof for me was, that the patient experienced a stitch in the direction of, or in the ear itself. It is hardly necessary to add that all the precautionary rules of procedure were the more carefully observed, since in a large majority of the cases I was obliged repeatedly to introduce the bougie at *the same sitting*.

In the greater number of the following cases the bougie

was used on both sides. The diseases as enumerated were :

1. Bilateral middle-ear catarrh . . .	53 times.
2. Unilateral " " . . .	11 "
3. Bilateral tympanitis pur. chron. . .	6 "
4. Unilateral " " " . . .	7 "
5. " " " acute . . .	4 "
6. Bilateral by-gone tymp. pur. chron. . .	8 "
7. Unilateral " " " " . . .	2 "
8. Bilateral affectio acustica . . .	6 "
9. Both sides, various affections . . .	3 "
Total . . .	100 cases.

The persons subjected to examination were from fourteen to eighty-five years of age ; the sexes equally divided.

The last three cases in the list require to be spoken of more in detail. In the first there was chronic middle-ear catarrh on the right side ; with affectio acustica, left. In the second, right, a by-gone tympanitis, pur. chron. ; left, chron. middle-ear catarrh. In the third, persistent tympanitis, pur. chron., right ; with same, by-gone, in the left.

Narrowing at the isthmus was shown in 1, 35 times ; 2, 3 times ; 3, 3 times ; 4, 6 times ; 5, 3 times ; 6, 6 times ; 7, 1 time ; 8, 4 times ; and 9, 2 times.

The frequency with which narrowing of the tube occurs in chronic middle-ear catarrh emphasizes and confirms the opinion of Urbantschitsch, *loc. cit.*, that, in this form of disease, examination with the sound should never be omitted, as also in the treatment of such cases bougies cannot well be dispensed with. Other forms of disease are here too poorly represented to allow of any conclusions as to the frequency with which diminution of calibre of the Eustachian tubes occurs in them. At any rate, the comparatively frequent occurrence of narrowing of the isthmus of the tube here shown in purulent middle-ear inflammation, as well as in by-gone purulent tympanitis, is remarkable.

That narrowing of the tube at the isthmus should be found only three times in eleven cases of one-sided middle-ear catarrh, is due to the fact that the swelling of the

mucous membrane has usually subsided when the patient consults a specialist because of the other symptoms of the disease.

Cases occur, however, where, in spite of the existence for years of a catarrhal inflammation of the naso-pharyngeal mucous membrane, no diminution of calibre of the tubes is to be found. The isthmus on both sides, in a woman *æt.* thirty-nine, who had suffered for a long time with a marked pharyngitis, with swelling of the nasal mucous membrane, and who was also scrofulous to a high degree, was found to be passable to a No. 4 Charrière. She had been for twenty years afflicted with caries of the left elbow-joint, and had numerous scars on her neck, the result of suppuration of glands. In addition to this, she had a bilateral purulent tympanitis, which had existed since childhood. I introduced the bougie very soon after the patient came under treatment for her ear and the naso-pharyngeal trouble.

Another patient, a twenty-year-old girl, who had had bilateral purulent tympanitis since childhood, which was quiescent for a short time only at long intervals, had almost abnormally wide Eustachian canals. The bougie could be passed with facility until that portion engaged at the isthmus measured more than 2 *mm.* in diameter. This case is exquisite, in that the bougie emerged through the external auditory canal, which, as is well known, does not often occur. The length of the tube, in so far as such a measurement on the living may be depended upon, was about 35 *mm.*

Since, in one hundred persons, the bougie was introduced sixty-three times on both sides, it may be worth while to discuss the comparative relative relation of the two tubes. That the examination was confined to one side in the remaining thirty-seven cases, is due in part to the fact, that some of the patients did not permit it; and, in others, one side of the nose was impassable to the catheter which I used. I find in my notes that the right side was generally indicated as the one where the obstacle existed. It must be expressly noted, however, that in *all cases* in which catheterization was repeated, the introduction of another

catheter of a different curvature and size was, without exception, successful, where the obstacle had been impassable to the thicker instrument. I only remember *one case* of the great number treated in this way, in the course of several years, where an obstacle presented which could not be overcome. Even in the apparently most difficult cases, perseverance and patience in the end succeeded.

Among the sixty-three cases which were examined as to both sides, thirty-four had catarrh of the tympanum, and in eleven cases there was a difference of lumen of the two tubes. A difference of *one* number (*Charrière*) eight times, and two numbers three times. The tubes on both sides were normal fifteen times. Among these last, one deserves particular mention on account of the nasal polypi which were repeatedly removed by means of the galvano-caustic apparatus.

In unilateral catarrh of the tympanum, to preserve the sequence as above, in two cases there was a difference of one number, and in two cases the tubes were normal.

Five cases of bilateral tymp. pur. chron. showed no difference of lumen in the two tubes. In three cases of this group, in which the two before named are included, the tubes were of normal calibre.

In unilateral tymp. pur. chron.; in four cases there was a difference of one number in one case, and in one case both sides were of normal size.

In the single case of tympanitis pur. acuta no narrowing of the tube existed.

In six cases of bilateral by-gone purulent tympanitis a difference of one number existed in one case only; likewise, in one case the isthmus on both sides easily admitted a bougie of $1\frac{1}{2}$ mm.

In one case of unilateral by-gone tympanitis pur. there was a difference of one number.

Five cases of affectio acustica showed in one case a difference of one number, and twice tubes of normal calibre.

In three cases variously affected on both sides, the tubes were of different size in the same individual, at different times; in one case they varied by one number, and in

another the isthmus on both sides remained passable for a bougie of $1\frac{1}{4}$ mm. in diameter.

If we consider the 163 cases together, in all of which the bougie had been introduced, we find that seventy-nine admitted No. 4, sixty-one No. 3, and fourteen No. 1. No mention is made of No. 2, because I find no note in any case that I was able to introduce it to any considerable extent farther than No. 3. In nine cases No. 1 could not be made to pass the isthmus. That this did not indicate closure of the tube was proven by the fact that air could be made to pass into the tympanum through the tube. Permanent closure of the tube is rare to that degree that Kramer,¹ to prove the "inutility of rhinoscopy," declares that in a practice of thirty-six years he did not meet a single case with insurmountable obstacle to catheterization and other forms of examination of the tubes, and hence he "never had occasion, save in *one* case, to plague his ear-patients with rhinoscopy."

Permanent obliteration of the pharyngeal opening of the tube, particularly as the result of syphilitic and diphtheritic ulceration, though rare, has been repeatedly observed, and confirmed by post-mortem examination, as well as closure of the ostium tympanicum as the result of purulent tympanitis. Permanent obliteration, however, in the continuity of the tube, except from a wound of the cartilaginous tube, as in the case of Bezold, *l. c.*, has hardly ever been observed. Only Wever² reports a case of total closure of the entire tube "by a fibrous substance which was closely connected with the mucous membrane."

The occurrence of stricture in the middle part of the canal is exceedingly rare, according to post-mortem records of experienced authors, and Schwartz³ says: "Real strictures, such as occur in the urethra (through thickening and atrophic shortening of the tissue), would seem not to take place in the Eustachian tubes at all."

I must mention the fact, not to leave my report uncompleted, that in three cases I succeeded in passing a larger

¹ *Loc. cit.*, p. 254.

² Quoted in Schwartz's "Gehör-Organ," page 107.

³ *Loc. cit.*, page 105.

bougie relatively farther in the canal than one of smaller size. This may be due to the fact that a larger bougie is less apt to become engaged by folds of mucous membrane, and also that when a bougie of larger size does become so engaged rotation on its long axis more readily releases it. Whether this fact may be so interpreted, that by greater stretching of the swollen mucous membrane, and by closer application of it to the walls of the tube, the larger bougie is enabled to penetrate farther than a smaller one, must remain undecided, for I do not remember to have ever seen any such projection of folds of the mucous membrane in the cadaver; still, according to Schwartze,¹ in chronic cases numerous folds and projections of the membrane at right angles to the axis of the tube do occur. They are generally situated at the pharyngeal orifice; higher up they are much less frequent, and most rarely in the bony portion of the canal.

I have not experienced any unpleasant accidents as the result of bougieing the tube, if I except emphysema three times, which was very slight and soon disappeared. If it be considered that I was obliged to bougie two or three times in each case in order to be sure of the amount of narrowing, and that with every change of the bougie I forced air through the tubes into the tympanum in order to be sure of the position of the catheter, and that in many cases a marked flaccidity of the mucous membrane of the naso-pharyngeal cavity and of the ostium pharyngeum tubæ existed, the accident certainly did not occur often. It is, however, demonstrated that with practice and careful manipulation the probability of such an unpleasant complication as a considerable emphysema will be reduced to the minimum. I must also emphasize the fact that one of the cases of emphysema did not occur as the result of the introduction of the bougie, but from catheterization, which I had done at a preceding sitting to prepare the way for the introduction of the bougie. That I may not have wounded the naso-pharyngeal mucous membrane, though it was much swollen, is quite probable, for there may have been a pre-existing tear which occasioned the emphysema.

¹ *L. c.*, page 102.

For the purpose of comparing the results of the experimentation upon the living with the same procedure upon the dead, but still more to inform myself as to certain things pertaining closely or remotely to the introduction of the bougie, I instituted a series of twenty-five post-mortem examinations of the organs of hearing, fifteen of which were upon adults and ten upon children of three years and under, in the following manner: The crania were sawn in two through the sagittal diameter, and after the roof of the tympanum had been removed, the height, and when the ostium pharyngeum gaped, also the breadth, of the Eustachian tube were measured, and finally the width, breadth, and depth of the fossa of Rosenmüller. Then I introduced, on the side of the head to which was attached the septum narium, a catheter of the same curvature but a little smaller (about $\frac{1}{8}$ mm.) than the one which I had used upon the living. It was made to penetrate as far as possible into the mouth of the tube, using the same manipulation as employed in the other series of experiments. The depth to which the catheter penetrated was carefully marked; then the catheter withdrawn and the extent of its penetration measured. I next introduced a bougie as large as would pass the isthmus, and when it appeared at the tympanic orifice of the tube I determined the length of the entire tube as well as its size at the isthmus. Now the bougie was pushed farther into the tympanum in order to see what direction it took, and in case it impinged upon the malleus to ascertain the distance of the latter from the tympanic mouth of the tube. After laying open the tube as far as the isthmus the cartilaginous portion was measured and the mucous membrane of the tube inspected. The bony portion of the canal was then laid open, through the centre of its long axis, with the saw. In the first case, after the ostium tympanicum had been exposed and measured in its two principal diameters, the bony canal was opened and its length determined. The measurement of the cartilaginous and bony canal together served as a check upon the measurement which had before been taken of the tube as a whole. According to Hyrtl, *l. c.*, the length of the tube is about one and a half inches, or

about 36 *mm.* I found the length of the Eustachian tube in adults to be between 36 and 44 *mm.*, and the isthmus to be from 24 to 28 *mm.* from the pharyngeal mouth. In the newly-born the tube is on the average 19 *mm.* long, eleven of which are in the cartilaginous and eight in the bony portion. In a child two and a half years old the Eustachian tubes were 23 *mm.* long, the cartilaginous 13, and the bony portion 10 *mm.* According to Huschke, *l. c.*, the length of the tube is fourteen to seventeen or eighteen lines in length, five to seven of which belong to the bony portion and ten to twelve to the cartilaginous. In the preparations from adults a sound two *mm.* in diameter could only be forced past the isthmus in two cases, while in the newly-born a sound of that size could always be passed; a condition which von Tröltsch¹ had in a general way remarked. He said: "The infantile tube, which is much shorter than that of adults, is not only relatively but absolutely wider at its narrowest portion."

In one of the adult tubes there was a depression in the bony portion which rendered the passage of the bougie as far as the tympanum impossible; the canal on the other side was normal. Kramer² came upon an obstacle on both sides in bougieing the Eustachian tubes in the cadaver. On the right side the obstacle was overcome; on the left, it was not attempted. After the tubes were opened it was learned that there was a depression in the bony canals on both sides. In another cadaver, where there was likewise an obstruction, it was found that the bougie was kept back by a flat bony projection on one side, and on the other by a narrow portion of the cartilaginous tube. Volkolini, in the cadaver of a man fifty years old, dead of morbus Brightii, saw a knee-shaped deviation of the tube, anteriorly, at the junction of the bony with the cartilaginous tube. On pushing a sonde à boule through the tube an obstacle was encountered an inch from the pharyngeal mouth of the tube, which was readily overcome; when being still farther pressed forward in the tympanum, it penetrated the mucous

¹ *Loc. cit.*, page 197.

² *Loc. cit.*, p. 4.

³ See *Monatschrift f. O.*, 1877, No. 3.

membrane over the promontory, and took a direction directly backward. After having been withdrawn and re-introduced and given another direction, it was afterward found that it had now entered the carotid canal.

The height of the pharyngeal mouth of the tube varied from six to nine *mm.* This variation depended, at least in part, upon whether the mouth of the tube was slit-shaped or oval; in the latter case the opening seemed to be widened at the expense of height. When the mouth gaped the height was reduced to three or four *mm.* In the newly-born the pharyngeal mouth of the tube is from three to four *mm.*, and the tympanic mouth three *mm.*, which is increased by barely one *mm.* in adults.

According to Kramer,¹ the distance from the ostium tympanicum to the head of the malleus, or handle, is three lines; according to my measurements the distance is from four to eight *mm.*

From a comparison of the measurements of the various sections of the tube and the proportion of the catheter introduced into the canal, given herewith, it follows, that when the bougie has been introduced about 24 *mm.* beyond the end of the catheter, it is enough, since then the instrument has passed the isthmus. Only in exceptional cases, in which a closure of the tympanic mouth of the tube is suspected, is there an indication, for the purpose of confirming the diagnosis, to push the bougie as far as the supposed occlusion.

Finally, let it be said here, that with the exception of *one* case, that of a two-year-old child who had suffered from bilateral tympanitis pur., and in whom the mucous membrane was moderately swollen, the mucous membrane of the tubes in all other cases appeared to macroscopic examination normal.

As to the direction which an instrument may take when introduced into the tympanum, Voltolini, *l.c.*, expresses himself as follows: "A probe goes for about a line in a direction parallel to the membrana tympani, along the inner wall of the tympanum, over the promontory directly tow-

¹ *Loc. cit.*, p. 5.

ard its posterior wall, and on its way generally strikes the chain of ossicula, particularly the stapes or the long process of the incus. Generally the sound or bougie goes straight through the angle which is formed by the stapes with the long process of the incus." In the majority of the twenty-five cases which I examined with reference to the direction taken by the bougie, it impinged against the head or the manubrium of the malleus. Seven times the bougie passed above the angle formed by the long process of the incus with the stapes toward the mastoid antrum; twice it impinged against the short process of the incus; once the bougie could not be made to enter the tympanum, on account of a fissure in the bony canal of the tube, and once it passed out at the ext. aud. canal. A similar experience in the living subject I have already mentioned. Voltolini, *l. c.*, reports a similar case. The bougie behaved as if it were constantly doubling upon itself at the pharyngeal mouth of the tube until it finally emerged at the ext. aud. canal, having perforated the membrana tympani in front of the handle of the malleus near the short process, following the posterior superior wall of the canal until it appeared externally. In my case there existed, in consequence of a long-continued purulent otit. med., total destruction of the *Mt.* In another case of Voltolini's, *l. c.*, a bony projection extended into the tympanic mouth of the tube, and when the sound passed over this process, it followed the roof of the cavity, and if under it, the floor. In the observations of Kramer, *l. c.*, the bougie, when it entered the tympanum at all always struck either the handle or head of the malleus. Hence it may happen that a bougie pressed with too much energy into the tympanum may cause great and not always reparable damage.

The pharyngeal recess (fossa of Rosenmüller) has a practical interest for the aurist in this far that, according to William Meyer,¹ it presents the place of election for adenoid growths: "Der constant und exquisit, das vorkommen adenoider Substanz darbietet." Meyer quite frequently saw the pharyngeal recess completely filled with a

¹ On adenoid vegetations in the pharyngeal recess. *Arch., f. O.*, new series, Bd. I., pages 253 to 254.

friable mass, the effect of which upon the tube in a case where there might be no other adenoid growth requires no comment.

In some respects a case observed by Schwartze,¹ would seem to oppose this view. Here a luxuriant tuberculous growth surrounded the fossa on one side, the recess itself being converted into a crater-form excavation twice the depth of that of its fellow.

I found the fossa of Rosenmüller in children to be from 5 to 8 *mm.* high ; in adults, 14 to 25 *mm.*, and in the latter, 6 to 10 *mm.* deep ; it has sometimes three times the elevation of the pharyngeal mouth of the tube on that side.

In regard to the therapeutical value of bougieing the Eustachian tube, I refer among others to the work of Urbantschitsch, and to the observations of the author.²

¹ *Loc. cit.*, pages 103, 104.

² *Zeitschr. f. Ohrenheilk.* Bd. XII., page 162, ff.

REPORT ON THE TWENTIETH ANNUAL MEETING OF THE AMERICAN OTOLOGICAL SOCIETY.

HELD ON THE 15TH JULY, 1884, AT THE GRAND HOTEL, CATSKILL MOUNTAINS.

By H. KNAPP.

In the absence of the President, Dr. C. H. Burnett, the chair was occupied by Dr. J. S. Prout, Vice-president.

The first paper was on

The Indications for Opening the Mastoid Process, Based on some Recent Observations, by H. KNAPP, of New York. The discussions on opening the mastoid, which were held in this Society last year, showed, the speaker said, greater divergence of opinion than the acquired knowledge of the profession seemed to warrant. He did not purpose to speak on the propriety of opening the mastoid in general, but to limit his remarks to the indication of this operation in three groups of cases, of each of which he would report one case from his recent practice.

1. *In acute purulent ot. med., the mastoid should be opened even if the post-aural region show nothing abnormal, when cerebral symptoms continue unabated in spite of an apparently free discharge after spontaneous or artificial perforation of the Mt.* The case reported, in support of this proposition, refers to a man suffering from acute otit. med.: paracentesis, free discharge, but for two weeks continuance of intense headache, dizziness, and nausea. On chiselling the mastoid open, a considerable quantity of matter escaped. Complete recovery in 7 weeks.

2. *In chronic purulent otitis media the mastoid should be opened when the size of the mastoid or a hard bony prominence of the pos-*

terior osseous wall of the ear-canal indicate sclerosing mastoiditis, and when, in spite of careful treatment of the tympanic cavity, cerebral symptoms, especially headache, are either constant or recur in frequent paroxysms. A case of this kind was reported, which had lasted more than ten years, rendering an otherwise healthy man unfit for work. The operation confirmed the sclerosing process, liberated mucoid secretion, and removed the headache. A perforated silver canula keeps the perforation open until the sclerosing process has exhausted itself.

3. *In subacute or chronic sclerosing (condensing, Buck) non-suppurative mastoiditis interna with an intact Mt, the mastoid may be opened when cerebral symptoms, especially intense and obstinate pain, radiating from the mastoid over the whole side of the head, incapacitate the patient for any work.* Under a wrong diagnosis every aurist of more extended experience has benefited some patients by trephining or chiselling a sclerosed mastoid process. Dr. K. has done the operation intentionally, under a correct diagnosis, in two cases, with perfect success. The first was published three years ago in the ARCHIVES OF OTOTOLOGY, vol. x, p. 365. The second occurred last winter. The patient—who for two months could not sleep, was constantly groaning for pain in mastoid and head, was confined to his room and bed, the head bundled up in cotton—was completely relieved by the operation, though no secretion was evacuated from the small, exceedingly vascular cells of the sclerosing mastoid. In six weeks he returned to his business, an altered man, and has remained well.

In conclusion Dr. K. described the manner in which he was accustomed to perform the operation : Small chisel, clean sponges for cleansing, perforated silver tubes for drainage, the mildest antiseptics for dressing, wound closed with sutures and compressive bandage in cases of sclerosis to obtain primary union, wound not united but without drainage-tube in acute mastoiditis, many cases of which get well immediately after the evacuation of the retained pus.

The second paper was on the same subject : **A Case of Eburnating Mastoiditis**, by J. A. LIPPINCOTT, of Pittsburgh, Pa. A girl of 17, *Mt* pale, dull ; light-cone absent. Hearing diminished. Inflation easy. Some tenderness upon pressure on mastoid. Constant dull pain in mastoid, great pain in head, anorexia, depression of mind. For about two years topical and general treatment, in particular KI and Hg, of no benefit. Mas-

toid, which was sclerosed, trephined to the depth of 17 mm. The pain disappeared and the hearing increased.

A lengthy discussion followed the reading of these two papers.

A. H. BUCK said that one of the benefits of the operation was to promote a free discharge, which he considered to be a powerful counter-irritation.

C. J. KIPP explores the bone when the peritosteum is detached, in order to find a place more discolored and softer than the others; in this place he makes the opening.

S. THEOBALD thinks that constitutional remedies may do a great deal of good, in particular iodide of potassium and mercury, in periostitic and hyperostotic processes.

S. SEXTON showed a series of photographs of neglected cases of mastoid disease, in which spontaneous perforation had occurred. He remembers but one of these cases—a child—that died. He had derived great benefit from the internal administration of sulphide of calcium. He would prefer to open the posterior osseous wall of the ear-canal in order to get access to the antrum.

W. W. SEELY thinks that the external opening is easily established and in itself of no consequence. He said that *optic neuritis* could not be used as an indication.

C. J. KIPP has seen one-sided optic neuritis. Death mostly occurs without optic neuritis, and optic neuritis from ear disease may get well.

J. A. ANDREWS related a new case of *purulent otitis* without external abnormality of the mastoid, but with *optic neuritis*. He took the latter symptom as a guide, opened the mastoid, found pus, and later a sequestrum, after the removal of which the patient recovered.

T. R. POOLEY has seen a case of one-sided optic neuritis which set in after the mastoid had been opened. Symptoms of thrombosis of the sinuses were present.

S. J. JONES remarked that the patient to whom Dr. Knapp had alluded as having had pronounced bilateral optic neuritis in the course of tympano-mastoiditis, had had no intra-ocular abnormality when he examined him during the acme of the inflammation.

A. MATHEWSON has not seen such decided benefit from opening the mastoid in cases of sclerosis, as to advise the patient to take the risk of the operation.

A. H. BUCK defines his plan of treatment thus: In *chronic* cases sclerosis is always present. There may be no external abnormality,

no tenderness on pressure, etc. If there is inadequate vent for the discharge, he opens the mastoid. He has tried to establish a channel into the mastoid through the middle ear, but found the procedure too difficult, and the consequence was such a degree of irritation and swelling that the outlet of the discharge was more impeded than before, and the patients suffered considerably. In *acute* cases there may be cause for disputing. He takes his decision by asking himself the question whether there is a sufficient outlet for the discharge. If not, he operates. We do not always find matter, and yet the patients are benefited by the counter-irritation.

A. H. BUCK, of New York, read a paper on the **Use of Large Doses of Iodide of Potassium in Cases of Rapid Loss of Hearing from Syphilitic Disease**. He had found in literature only four cases in which this disease had been benefited by large doses of iodide of potassium—two by Roosa and two by Webster. He reported five cases :

CASE 1. Rapid loss of hearing, from syphilis, with mania. The mania was cured by very large doses of iodide of potassium, the deafness remained.

CASE 2. Used hydrargyrum, later iodide of potassium. No improvement.

CASE 3. Syphilis 25 years previously. Deafness not cured.

CASE 4. Syphilitic deafness in right, sudden in left before. No result from treatment.

CASE 5. Syphilis. Sudden and total loss of hearing in both ears. Only slight benefit from treatment.

T. R. POOLEY has seen such a case in which the hearing improved to understanding ordinary voice at 5'.

H. KNAPP remembers two cases of total binaural deafness from syphilis, hearing lost almost suddenly. He treated them at the hospital for months with mercurials and large doses of iodide of potassium. The deafness was and remained absolute.

S. SEXTON has seen from 15 to 20 cases of more or less marked loss of hearing from syphilis. He thinks that the large doses of KI and Hg are of no benefit in otherwise hopeless cases, and are not needed in cases which by their nature are amenable to treatment.

C. J. KIPP has during the last year repeatedly found that inherited syphilitic ear-disease was of tympanic origin, whereas formerly he believed it to be labyrinthine exclusively.

A. H. BUCK mentioned a case of syphilitic ear-disease complicated with hemiplegia, treated and improved with Hg and KI.

S. J. JONES asked whether KI alone or Hg produced the good result.

H. KNAPP said that he had treated a gentleman for syphilitic middle-ear disease a long time locally in the ordinary way and with small and moderate doses of KI. Hemiplegia occurring, he sent the patient to Dr. Loomis, who ordered very large doses, from 15 to 30 grams a day; the patient very soon improved, his hemiplegia disappeared, and the hearing was somewhat improved. This was about ten years ago, and the patient has had no relapse nor any other syphilitic manifestation.

A. MATHEWSON also mentioned two cases.

W. W. SEELY, of Cincinnati, read a paper on the **Treatment of Suppurative Otitis Media**, in which he laid great stress on cleanliness and keeping the E. tube patulous. In some cases he instilled an infusion of **jequirity** into the ear. It was followed by discharge and pains, in one case by excessive pain for two nights. Results good.

J. J. B. VERMYNE, of New Bedford, Mass., read two papers. The first on a **Tumor Springing from the Ethmoid**, in consequence of chronic catarrh of the naso-pharynx, and causing exophthalmus; the *second* on a case of **Myxofibroma from the Basis Cranii**, causing blindness, and seven years later complete deafness by destruction of the labyrinth. The autopsy showed that the tumor had extended considerably into the middle cranial fossa.

C. J. KIPP, of Newark, N. J., read a paper on **Tumors of the Auricle**. Report of three cases of an epithelioma situated in the concha, measuring 12 mm. by 7 mm. Its clinical aspect was that of a granuloma, but its structure that of an epithelioma.

L. HOWE, of Buffalo, N. Y., read a paper on a case of **Othæmatoma of both Ears**. He injected ergot, 3-5 drops, which improved the disease.

S. SEXTON believes that othæmatoma auris is almost always of traumatic origin.

H. SEXTON showed a photograph of a case of sarcoma in the concha, and of a number of other cases; he exhibited, further, several plaster casts of diseased sets of teeth taken from persons suffering from ear disease.

Prof. CLARKE, delegate from the Society of Deaf-Mute Teachers,

made interesting remarks about a new acoumeter, devised by Prof. Graham Bell ; further, on the keen perception of vibrations by deaf-mutes, and asked whether or not it was possible to increase the acuteness of hearing by education. It seemed to be the sense of the Society that education, much as it could do to raise the usefulness of the auditory organ, could scarcely be supposed to be capable of increasing the acuteness of hearing, which, like the acuteness of sight, depended on the physical conditions of the auditory organ, not on practice. Referred to a committee.

Before adjourning, the Society elected as officers for the next year, C. H. BURNETT, President ; and J. J. B. VERMYNE, Secretary. The place of meeting will, as usual, be determined by the Sister Society, the Ophthalmological.

REPORT ON THE PROGRESS OF OTOLOGY IN THE SECOND HALF OF THE YEAR 1883.

Translated by Dr. C. ZIMMERMANN, of New York.

I.—NORMAL AND PATHOLOGICAL ANATOMY AND HISTOLOGY OF THE ORGAN OF HEARING.

BY H. STEINBRÜGGE, OF HEIDELBERG.

1. Prof. E. ZUCKERKANDL, of Graz. To the morphology of the musculus tensor tympani. *Archiv f. Ohrenheilkunde*, vol. xx., No. 2, p. 104.
2. Dr. VON MONAKOW, physician in St. Pirminsburg (Switzerland). Experimental contribution to the knowledge of the corpus restiforme. *Archiv f. Psychiatrie*, vol. xiv., No. 1, p. 1.
3. Dr. C. F. W. ROLLER, of Kaiserswerk. About the ascendant root of the auditory nerve. *Archiv f. Psychiatrie*, vol. xiv., No. 2, p. 458.
4. Dr. WILLY MEYER, Assistant Surgeon to the Surgical Clinic of Bonn. A contribution to the malformations at the first branchial arch and fissure. *Langenbeck's Archiv*, vol. xxix., No. 3.
5. Dr. C. M. HOPMAN, of Cologne. The papillary tumors of the mucous membrane of the nose. *Virchow's Archiv*, vol. xciii., No. 2, p. 213.
6. ARTHUR BOLLER LEE. Remarks on the structure of the chordotonal organs. *Archiv f. microscop. Anatomie*, vol. xxiii., No. 1, p. 133.

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1. The author refers to the investigations of Magnus, upon the musculus tensor tympani (published in *Virchow's Archiv*, vol.

xx.), and agrees with the latter in regard to the anatomy of the muscle and its insertion ; whereas, in regard to its function, he attributes a more extensive power to the muscle than Magnus does. His results are as follows :

a. The greater (lateral) portion of the tensor tympani passes over into the tendon of the muscle ; therefore the hammer always answers the contraction of this portion of the muscle by a motion.

b. A smaller (medial) portion of the muscle (varying in size, does not pass over into the tendon of the tensor, but is inserted into the processus cochlearis of the external surface of the petrous bone.

c. The tendon of the tensor is united with a ligament, extending from the processus cochlearis to that part of the hammer where the tendon of the tensor also is inserted. This ligament is to be called "intermedial ligament," according to Magnus.

d. Some fasciculi of the tendon of the tensor proper are so closely inserted into the processus cochlearis, that they remain as a tensely stretched ligament with the intermedial ligament, even after excision of the whole muscle.

To find out the function of the medial portion, inserting itself into the processus cochlearis, Zuckerkandl investigated the auditory apparatus of the dog, hare, deer, horse, roe, cattle, sheep, and pig. The tensor tympani appears more spherical in these animals, is thicker than the human, and is enclosed in a depression of the petrous bone. In some of these animals there is another (lateral) portion of the muscle in addition, extending to the tube, called *pars tubaria* by the author. The latter consists always of muscular tissue ; the portion enclosed in the depression contains only few thin muscular fibres, and consists mostly of fat and connective tissue. The tensor of the dog forms the only exception—having no *pars tubaria*. Man has the *pars tubaria* only.

Zuckerkandl agrees with Gegenbaur in regard to the morphological category of the tensor—viz., that it corresponds to a facial muscle of the lower vertebrates, in the same way as the two first ossicula are homologous to facial bones of the lower vertebrates. It is not decided yet which facial muscle comes into question ; authors also differ in regard to the homology of the hammer and incus.

The fatty degeneration of the spherical portion of the muscle has not to be ascribed to the domestication or fattening of the

animals (*e. g.* in the pig), as it is observed also in animals not fattened. The author inclines rather to consider the fatty portion of the tensor as a remainder of a (jaw) muscle entirely out of activity, of which only such a quantity of muscular substance is left, as the function of the hearing organ requires. Finally, Zuckerkandl thinks the medial portion of the human tensor, inserted into the wall of the labyrinth, with the fixed portion of the tendon and the intermedial ligament, might be considered homologous to the fatty muscle in animals, especially as a depression sometimes is found at the hindermost part of the muscular canal suggesting the muscular receptacle in animals.

2. MONAKOW succeeded in keeping alive a rabbit, of which the left half of the spinal cord was cut through immediately below the pyramidal decussation. The animal, at first paralyzed on the left side, recovered gradually, and was killed six months later. The description of the atrophy of different fibres and the anatomical conclusions from it are given in detail in the original paper; it will suffice to communicate only the results in regard to the auditory nerve. The most important was, that the auditory nucleus, consisting of large cells (Deiter's nucleus according to Laura; nucl. lateral., Stieda-Schwalbe; external acoustic nucleus, Meynert-Clarke), had entirely disappeared, a few ventral and medial ganglion cells excepted. The fibres of the anterior root, and partly the inner portion of the posterior root arise from this nucleus according to most authors. The left roots of the auditory nerve, however, had the same size and number as the right. The preparations did not show whether fibres of the auditory nerve enter into the corpus restiforme.

The supposition that Deiter's nucleus is an auditory nucleus is entirely wrong, according to Monakow; it is rather connected with the spinal cord and is to be considered a nucleus of the funiculus cuneatus. The supposition, that it represents a kind of centre of coördination, would be quite legitimate, as this is the function of the funiculus cuneatus. The assertion of Roller, that the fibres coming from the funiculus cuneatus (described by him in these ARCHIVES, vol. x., p. 76), are an ascendant acoustic root, is confuted by the proof that Deiter's nucleus is not connected with the auditory nerve.

3. ROLLER defends his former statements in regard to the ascendant root of the auditory nerve against Monakow, showing that the bundle, described by him as the ascendant root of the audi-

tory nerve, remained intact in spite of the atrophy of the cells of Deiters' nucleus. He had concluded from his former investigations that only a portion of the mentioned bundle possibly joined the ganglion cells of the nucleus, but the remainder entered the inner root directly. The roots of the auditory nerve remaining intact, Deiters' nucleus being destroyed, therefore did not invalidate his deduction.

4. An abstract of fourteen cases of malformation of the auditory organ is given, in which the abnormalities mostly affected the parts developing from the first branchial fissure and the first and second branchial arches. The case, observed by the author himself, was a man, otherwise perfectly normally developed, who died from a villous cancer of the bladder. The malformation was confined to the right organ of hearing, showing, *primo loco*, a rudimentary auricle (see the details in the original paper) in the upper part of which there was a fistula 2 mm. deep. Cartilaginous meatus 5 mm. long. The pyramis of the petrous bone seemed to be diminished in sagittal direction and thickness but enlarged in length. Os tympanicum, rudimentary. Processus styloideus, more inward and backward. Fissura Glaseri, slightly marked. Fossa jugularis, very deep. Osseous meatus, shortened and narrowed, with anterior convexity, its calibre changing very irregularly; the wall at the fossa glenoidea thin, above 1.5 cm. thick. Drumhead, even, thick, little transparent, height 5 mm., inclination about 40°. Tympanic cavity, moderately lessened in size. The ossicula are rudimentary, situated in the upper anterior portion of the tympanic cavity, fastened by a narrow, osseous bridge. They seem to be parts of the malleus and incus, not far enough backward. Stapes and musculus stapedius are wanting. Semicanalis tensoris tympani, hyperostotic. Tendon of the musc. tens. tymp., extending to the posterior rudiment of the ossicula. Ost. pharyng. tubæ osseæ, pretty narrow, 8 mm. distant from the lower opening of the carotid canal. Fenestra ovalis and rotunda exist, a membranous closure of them not noticeable. Mastoid cells small, inner ear perfectly normal, its cavities somewhat narrowed on account of the compactness of the bone. Meatus aud. int., inward covered, begins as a semicanal; 6 cm. long. Auditory and facial nerves of the same size as the right. Left external ear, meatus, and petrous bone normal. Lower jaw symmetrically formed. The patient always heard worse with the right ear. The malformation is congenital. The

author recalls the fact that these anomalies of development take place in the first weeks of foetal life, and that it is not a simple defect, but the result of irritation and inflammatory process in a certain district. The first and second ossicula, situated outside the tympanic cavity in an early stage of development, according to Koelliker, were rudimentary and arrested in their progress to their normal situation. Concerning the development of the stapes the author follows Salensky's opinion, that it is to be considered an independent centre of cartilage-formation in the district of the first visceral arch, as the face is normally formed and the processus styloideus is present. The author is right in adding, that malformation of this kind can never give a distinct idea of the physiological process of development, as the irritative alterations are not always confined to a branchial arch. Finally he reminds us that these malformations occur more frequently on the right side than on the left, (*cf.* Welcker), a fact not yet explained. The question is only shifted if we recur for explanation to the frequently observed asymmetry of both halves of the body. At the end Meyer mentions from literature several cases which prove that the hearing might be fair in spite of external malformations if only the labyrinth is intact, the vibrations being conducted by the cranial bones.

5. HOPMAN found 76 mucous polypi, 10 harder fibromata with angio-adenomatous tumors, 13 papillomata, and 1 epithelioma, among 100 nasal tumors. The author states that papillomata are not mentioned in the papers of Billroth, Friedreich, Semeleder, and Czermack, and gives a review of the opinions advanced in regard to these tumors by Virchow, Lücke, Förster, Roser, Weber, Klebs, and Rindfleisch. He says that modern rhinologists describe the nasal polypi according to Billroth's well-known monograph. Fourteen personal cases are reported, and one of a benign epithelioma. The formation of the papillæ takes place by the epithelial layer growing into the tumor in the form of cones, with intermingled septa. These afterward decay in the centre, and cause manifold indentations at the surface. Sometimes there are proliferating glandular parts, a considerable development and ectasis of the vessels, an infiltration with small cells in the fibrous or alveolar framework of the tumors, so that some of them might be called adenoma, angioma, or fibro-sarcoma papillare. The author prefers the name papilloma, from clinical reasons. The tumor called epithelioma papillare was exactly like Billroth's vil-

lous cancer of the nasal mucous membrane, but turned out favorably. The tumor obstructed both nasal cavities, raising cartilage and soft parts, caused partial atrophy of the bones, and an eversion of the nose (according to Demarquay and Von Bruns); it was constricted in portions and removed by cauterization. Scraping out the ethmoidal bone, cauterization with chloride of zinc, recovery by first intention. The tumors weighed 54 grms., showed a fibrous vascular stroma penetrated in every direction by club-shaped or longitudinal epithelial cones, communicating with each other, and representing the predominant mass of the tumor in comparison with the connective tissue, the vessels, and the large polygonal or oval nucleated cells of the pavement epithelium. After several slight relapses it ended in perfect recovery, with no return in two years (the time of this publication). The author thinks the difference between the papillomata and the mucous polypi is that the latter have always a smooth surface, contain a good deal of albuminous serum, shrivel in alcohol, assuming an opaque white-yellowish color, and leaving a piece of mucous membrane by bruising. The mucous polypi are poor in glandular tissue (contra Billroth) and in cysts, and never originate in the lower turbinated bones. The papillomata represent a tight or loose papillary excrescence with a broad base, the surface of which shows short pedunculated berries, or thickly set small papillæ. Both forms are frequently combined. Their site is always at the lower turbinated bone. The limit is not easily to be drawn between the frequent hypertrophies of the mucous membrane of the lower turbinated bone and the real neoplasms. Chronic nasal catarrhs, commonly considered to be a cause of the neoplasms, occurring so frequently without any such formations, a certain predisposition has to be assumed. This supposition is supported by a report of three cases with syphilitic dyscrasia. In regard to the symptoms, he says, that there is generally a chronic rhino-pharyngitis, besides the papillomata of the turbinated bone, with predominating pharyngeal disturbances, continuation of the inflammation to the larynx and trachea. Coughing in the morning, and eructation of phlegm give rise to the supposition of an affection of the respiratory organs. Hopman uses the Duplay-Charrière screw-speculum for the examination. The prognosis is generally favorable, although relapses may be expected. The author uses Blake's polypus snare, modified by Zaufal, and a galvano-caustic snare especially constructed for

that purpose. The latter does not always prevent the bleeding, and the cold snare has the advantage, of being a handier instrument. After-treatment with simple absorbent cotton and insufflation of iodoform. Snuffing of water, not the douche, is used.

(6) LEE, in his investigations upon *Diptera-larvæ*, follows Graber in regard to the terminology (These ARCHIVES, vol. xi., p. 255 and following), but came to other results in regard to the morphology of the chordotonal organs. Commonly the rods of the above-mentioned organs are described as conical bodies, terminating at the proximal end in a point, which passes over into the so-called chorda, an axial thread connected with a ganglion cell. Lee, however, found that they have no point, but terminate in a tube, enveloping an axial thread, with the proximal end. The rod represents thus not a terminal swelling of the nerve-fibre, but only a capsule of it. The author calls this capsule "apical utricle." If it collapses, it leaves a solid string, the "chorda" Graber's. Neither the capsule nor the axis-fibre could be followed up to the ganglion cell, but the distal end of the thread could be discovered in a terminal bud situated right below the end of the rod. This bud seems to be hollow, is hemispherical or elongated, and then somewhat constricted in the middle, and probably passes over into the lumen of the cephalic canal. The head of the rod was slender, consisted of two parts, not simply cylindrical or conical, in all larvæ. The so-called distal chorda is found on all chordotonal rods, therefore Graber's distribution into amphinemetic and mononemetic rods has to be abandoned, since all are amphinemetic.

The fixing ligament is always a tube with thin walls, sometimes double, and minutely striated lengthwise. It contains a clear liquid or a varying quantity of a highly refracting substance, is inserted into the head or envelopes the whole rod, extending farther in a proximal direction. The whole arrangement is probably so that a tube, proceeding from the capsule of the ganglion cell, enveloping an axis-fibre, swells to a rod-body and terminates, lessened in size, at the integument as distal chorda. The head seems to be an annular thickening of the rod and to serve for the insertion of the terminal bud of the nerve.

The truncal chordotonal organs, as a rule, have a paired arrangement, a polyscolopic and a monoscolopic system existing in every segment.

II.—PHYSIOLOGY OF THE EAR AND PHYSIOLOGICAL ACOUSTICS, IN THE YEAR 1883.

BY OSKAR WOLF, OF FRANKFORT-A-M.

1. LUCÆ, Professor in Berlin. Lecture on the resonance of the pneumatic cavities of the auditory apparatus. Transactions of the Physiol. Society of Berlin, No. 9, 1882-83.

2. Dr. FREDERIC BEZOLD, Instructor at Munich. The closure of the Eustachian tube, its physical diagnosis and influence upon the function of the ear. *Berliner klin. Wochenschrift*, No 36, 1883.

3. PEDRONO. Udizione colorata. *Gaz. Ital.*, Lomb., 1883.

4. VULPIAN. Experiments on the disturbances of motility caused by a lesion of the auditory apparatus. *Gaz. hebdomadaire*, 1883, 3. *séance de l'Académie des Sciences*, 1883, 8th January.

1. Turning the ear toward the wind (*i. e.*, if it is blown into like a resonator, REV.) one perceives a pretty low noise, accompanied by some higher tones. The fact that, on pressing the auricle slightly to the skull, this noise decreases, but is not essentially changed in its quality, shows, according to the author's opinion, that it is brought about by a resonance of the deeper parts of the ear. Since the tone proper to the "meatus-drumhead," is very high (*viz.*, in the four-times marked octave), another portion has to accompany its vibrations, namely: the "tympanic-cavity and mastoid cells," even if a lower resonant tone should be produced. Lucæ proved by the following experiment that this lower resonant tone is mostly produced by consonance of the pneumatic cavities of the middle ear. If a glass pipe, 6 cm. long, which, if blown separately, gives c^3 , is added air-tight to a spherical resonator tuned to c^1 , the fundamental tone of the apparatus becomes much lower—it descends to H. If now a stretched membrane is placed between both parts the proper tone of the apparatus is raised to about f^1 . The proper tone becomes the higher the more the membrane is stretched.¹ This apparatus corresponds to the system "meatus, drumhead, middle ear, mastoid cells" in regard to its resonance, only with the difference that the "mastoid-tympanic cavity" does not form one large cavity, as the globe of the resonator, but a system of pneumatic cells, commu-

¹ REV. has set forth this condition of curved membranes in his "Membranversuchen," and shown that a pretty low tone of strongest resonance exists for one ear besides the very high proper tone of the portion "meatus-drumhead." Compare: "Speech and Ear," pages 196 and 215.

nicating one with another, like those of a sponge. Lucæ, therefore, filled the globe of the resonator with dry sponges and repeated the experiment. The remarkable fact resulted, that the resonator did not lose its original tone, c^3 , although the resonance was now decreased. Lucæ showed further at the dead subject that, after removal of the drumhead, the tone of the ear was much lowered (almost one octave), so that by blowing into this ear a lower noise is heard than by blowing into the intact ear. By removal of the other drumhead both ears are tuned equal again.

2. BEZOLD discusses the origin of the normal cone of light at the drumhead, after considering the causes of closure of the tube and its clinical features. He, like most authors, thinks that it is the direct reflex of an obtuse-angled funnel. Why the cone of rays always appears in the same direction in the anterior-lower quadrant of the drumhead, he explains as follows: "Poltzer showed that after removal of the meatus, the triangular reflex runs over the whole outer surface of the drumhead by turning it gradually, but we perceive a reflex from that portion only which is perpendicular to our visual line. The invariable position of the reflex thus depends upon the inclination of the drumhead and the direction of the meatus, to which our visual line has to be adjusted. The outer surface of the drumhead looks downward and forward, as the drumhead is inclined in a double manner, its upper and its posterior periphery being more lateral. If the surface of the funnel were inclined downward alone, a triangular reflex could only appear vertically downward; if it looked forward alone, the reflex could only be horizontal. As, however, the drumhead has an intermediate situation, a reflex from a funnel lies between the vertical and horizontal directions—*i. e.*, forward and downward. On a section through the axis of the meatus, dividing the reflex into two halves in its length, we easily see that only the region of the reflex, is perpendicular to our visual line." A very instructive drawing illustrates the different situations of the drumhead during rest, rarefaction or condensation of air, and the corresponding changes of the reflex. When the drumhead bulges forward, the normal reflex becomes broader, more indistinct, and shorter; when it sinks in, approaching more the funnel-shape, the reflex becomes longer, and thinner at its basis. We see this form seldom, because the membrane soon sinks *in toto*, if the tube is constantly closed, and assumes the form of a kettle. Then the former reflex can, of course, not retain its triangu-

lar form, but it passes over into the real image of a concave mirror. As a reflex from a concave surface, it moves more and more to the periphery, and exhibits a very characteristic symptom for closure of the tube. Sometimes we miss the reflex, just described, in closure of the tube. Bezold explains it, that the position of the drumhead is in an intermediate stage in those cases, between kettle and funnel, if the radial fibres are not sufficiently stretched. In this case our optic axis strikes no portion of the drumhead perfectly vertically, so that no reflex appears. The transformation from the funnel shape into the kettle shape is confined only to the middle portion of the drumhead, the periph-
eric zone obtaining its position so that an annular bent is produced, giving a linear reflex in front and below (Politzer). Then the origin of the various smaller reflexes at the processus brevis and the membrana Shrapnelli is explained. Bezold points out that the anomaly in the function, which arises in closure of the tube, is due mostly to the difference of air-pressure in the tympanic cavity and the external atmosphere, and not at all chiefly by the changed form of the drumhead. This difference of air-pressure causes a great anomaly in the unstable equilibrium of the entire apparatus, which, on a small over-pressure, does not conduct the vibrations exactly any more, as in the normal state it is regulated by antagonistic forces. No wonder that the acuteness of hearing decreases even to $\frac{1}{10}$ of the normal by increase of one-sided increase of pressure.

3. PEDRONO recognizes the fact that, with perception of certain musical tones, the perception of corresponding colors is connected. To explain this phenomenon (perhaps pathological, according to the author) he assumes an aural and a visual centre (*un centro cerebrale auditivæ visivo*) in the gray cerebral substance situated very near to each other. It is an irradiated or associated central perception.—Moos, *REV.*

4. On injection of a 25 % solution of chloral hydrate into the ear of a rabbit, peculiar motor disturbances set in after a quarter of an hour, reaching their maximum one day after the operation: giddiness, oscillation of the head, turning of the body round its vertical axis, and rolling movements. The eye of the operated side looks downward, the other upward. Both eyes showed vertical nystagmus. The facial nerve of the operated side was paralyzed. Every excitement produced rolling movements. The symptoms gradually diminished after a few days, the paralysis

of the facial nerve excepted. *Post-mortem examination*.—Destruction of the drumhead, pus in the tympanic cavity, hyperæmia and beginning suppuration in the labyrinth. Not the least alteration of the cranium, or the brain and its membranes.

Result.—Chloral penetrates rapidly through the drumhead and both fenestræ of the labyrinth, and acts upon the semicircular canals and the cochlea.—Moos, Rev.

III.—PATHOLOGY AND THERAPEUTICS OF THE ORGAN OF HEARING.

BY A. HARTMANN, OF BERLIN.

GENERAL.

1. Dr. K. BÜRKNER, of Goettingen. Contributions to the statistics of aural diseases. *Arch. f. Ohrenheilk.*, vol. xx., p. 81.
2. Medicinalrath Dr. HEDINGER, Stuttgart. Clinical reports of the Aural Institute of Stuttgart, 1880-'82, etc. E. Schweizerbart, publisher, 1883.
3. Prof. E. DE ROSSI, Rome. XII. anno di insegnamento della otojatria. XII. school year of otology, 1883.
4. A. EITELBERG, Vienna. Upon the influence of hearing exercises upon the sense of hearing of the exercised, and especially of the other, not exercised, side. These ARCHIVES, vol. xii., p. 266.
5. G. BRUNNER, Zürich. On the etiology and symptomatology of so-called autophony. These ARCHIVES, vol. xii., p. 338.
6. E. E. HOLT. Acuteness of hearing under various conditions. *Trans. of the Am. Otol. Soc.*, 1883.
7. Medicinalrath Dr. HEDINGER, Stuttgart. The aural diseases of the railway employees. *Deutsche. med. Wochenschrift*, No. 27, 1883.
8. C. J. KIPP. On the connection of aural diseases with synchysis scintillans of the vitreous. *Trans. of the Am. Otol. Soc.*, 1883.
9. WEBER-LIEL. On the influence of sexual irritations upon affections of the organ of hearing. *Monatschr. f. Ohrenheilkunde*, No. 9, 1883.

10. Dr. SCHWABACH, of Berlin. On hereditary syphilitic affections of the ear. *Deutsche medicinische Wochenschrift*, No. 38, 1883.

11. BERTHOLD LEWIN. Boracic acid and its modern use in practice. Inaug. Dissert., Bonn, 1883.

12. F. B. EMERSON, New York. The test of hearing with the tuning-fork. *These ARCHIVES*, vol. xii., p. 62.

13. SAMUEL SEXTON. Conduction of sound to the ears through the tissues in aural disease. *N. Y. Med. Record*, July 28, 1883.

14. Dr. EITELBERG, Vienna. On massage in ear-diseases. *Wiener med. Presse*, No. 26, ff., 1883.

15. Prof. ZAUFAL. Massage of the ear. *Prager med. Wochenschrift*, No. 44, 1883.

16. Dr. HEDINGER, of Stuttgart. The forensic significance of hemorrhages in the ear. *Wurtf. Correspondenzblatt*, No. 35, 1883.

17. J. A. ANDREWS. The diagnosis of cerebral complications in ear disease with the ophthalmoscope. *Trans. of the Amer. Otol. Soc.*, 1883.

18. Dr. BEZOLD, of Munich. A medico-legal case of injury to the ear with a pointed instrument, the patient being accused of simulation and perjury. *Berliner klin. Wochenschrift*, No. 40, 1883.

19. Dr. C. MULLER, of Wiesbaden. Two cases of paralysis of the trigeminal nerve. *Arch. f. Psychiatrie*, vol. xiv., No. 2.

20. AUGUST LUCAE. The spray ("Wasserstrahlgebläse") and its application as an air-douche. *Arch. f. Ohrenheilk.*, vol. xx., p. 161.

21. F. P. NORRELL. Deafness among pupils. *Trans. of the Amer. Otol. Soc.*, 1883.

22. CHARLES G. LEE. Remarks on visual disturbances in deaf-mutes. *British Med. Jour.*, Dec. 15, 1883.

23. Dr. HEINRICH BIRCHER, of Bern. The endemic struma and its relations to deaf-mutism and cretinism. With three plates. Basel, 1883.

(1) BÜRKNER has arranged the material of different reports containing together 58,645 cases, but frequently classified from different points of view, into six tables, from which he draws the

conclusion that ear diseases are more frequent in the middle age of life and in men than in youth and old age, resp. in women, and are mostly the consequence of colds, infectious diseases, and affections of the naso-pharynx. The acute affections of the middle ear are more frequent in the spring and winter than in autumn and summer. Sixty-seven per cent. of all diseases are those of the middle-ear, twenty-five per cent. external, eight per cent. internal ear.

(2) HEDINGER reports over 3,139 ear-patients, treated from 1880-1882. The various affections are discussed separately, and a great number of interesting clinical histories are given. The assertion appears striking, that cerumenal plugs are frequently observed together with vegetations of aspergillus, whereas Siebenmann, whose paper is cited, proved that aspergillus does not vegetate upon cerumen. It would lead too far to raise doubts on many opinions expressed in this paper, on some erroneous conceptions of papers of other authors, and on a few slips of the pen, such as "neuralgia of the facial nerve," etc. Some parts of the paper—viz., the results of examinations of deaf-mutes and railway employés—have been published before.

(3) ROSSI reports 611 diseases in 578 patients during one year: 117 affections of the external ear; 423 of the middle ear; 21 ear-polypus, caries, and necrosis of the temporal bone; otalgia 2; diseases of the internal ear 32. He adds a communication of a great number of observations in detail, among which are some remarkable.

(6) HOLT examined (1) 24 persons with chronic, not suppurative, catarrh of the middle ear; (2) 24 machinists; (3) 24 boiler-makers; (4) 24 persons with normal hearing. In the first he found that the tuning-fork was heard 2.2 times longer through the air- than through the bone-conduction, and the upper limit for König's rods was an average of 35,000 vibrations. In the second the tuning-fork was heard 2.5 times longer through the air- than through the bone-conduction, and the upper limit for König's rods was 40,000 vibr. In the third, t.-f. 2.4 times longer through air- than bone-conduction, and the upper limit for König's rods was 39,000 vibr. In the fourth, t.-f. 3.7 times longer through air- than bone-conduction. He found that the acuteness of hearing for voice and watch decreased in the same rate as for air- and bone-conduction. He thinks that the weakened hearing in machinists and boiler-makers is due to a defect in the sound-

conducting apparatus. He does not believe that they hear better during a noise.

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(7) HEDINGER compares the occurrence of diminished hearing in railway employees according to the special employments. He examined 564 persons. For brakemen and switchmen the proportion is the most favorable, for conductors and line-keepers the most unfavorable, according to table I. These statistics do not entitle to a conclusion upon the influence of the different occupations upon the difficulty of hearing on account of the very different age of service.

In table II. he considers the different employments separately, according to the age of service resp.; he puts together the number of persons with different hearing, of different occupation, but of the same length of service, and in table III. he investigates the decrease of hearing-distance, according to single years of service, but divided into categories of employment. The result was, that, with small fluctuations, the difference in decrease depended not upon the occupation, but upon the length of service. There is a progressive decrease of hearing in railway-employees, remaining far behind the corresponding decrease of machinists, which is not greater than the decrease in common life. It is a sclerotic form of chronic catarrh of the middle ear, most frequently a consequence of a chronic affection of the pharynx; there was not one affection of the labyrinth among the five hundred and sixty-four cases. Subjective noises occurred seldom.

(8) Six cases are reported by KIPP, in which synchysis of the vitreous existed with deterioration of hearing. In the following discussion Little, Webster, and Knapp stated that they never observed any such connection.

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(9) Affections of the uterus, irritating and normal processes in sexual life have frequently quite an unfavorable influence upon an existing ear disease, according to WEBER-LIEL. Slight affections change their character by reflex action, motor or sensitive or vasomotor disturbances developing within the middle ear. The local treatment is unsuccessful as long as the irritation from the uterus exists. If the irritation has subsided, the special character of the affection ceases. The pain in the last dorsal and first lumbar vertebræ is never wanting in those cases. Masturbators, especially women, prove the influence of the sexual sphere upon existing ear diseases, so that the practice of masturbation may be diagnosed from the peculiar course of the ear disease. Under the same in-

fluence otorrhœa is very obstinate, and cure is very tedious. Progressive difficulty of hearing with noises, especially in women and old maids, often has this same cause, and defies every treatment, the electric perhaps excepted. Marriage ought not to be recommended to delicate and excitable women afflicted with difficulty of hearing, since all sexual excitements deteriorate the aural affection.

(10) SCHWABACH observed sudden vertigo, noises, and great diminution of hearing in two cases treated for parenchymatous keratitis. The examination revealed in both an affection of the labyrinth. The clinical history gave in the first case none, in the second only slight points for the syphilitic nature of the affection. Schwabach, therefore, refutes the opinion that an hereditary syphilitic affection has to be thought of, without hesitation, in all cases where an inflammatory affection of the eye is followed by deafness, noises, and vertigo. He illustrates this by a third case, where nearly complete deafness occurred after granulous ophthalmia, without the parents of the patient ever having suffered of lues.

(11) LEWIN gives at first an accurate history of the application of boracic acid and the knowledge of its chemical qualities, then discusses its occurrence in nature, the different systems of its preparation from the fumaroles, its chemico-physical properties, the doses and mode of application of the bor. preparations, and reports then a series of experiments in which fibrine of blood was exposed to the air with bor. solutions of different concentration. The result was, that solutions of bor., stronger than 0.5 % prevent, invariably, formation of bacteria and putrefaction, but not the formation of mould. Studying the exposed mesenterium of a frog after touching it with a 4 % solution of boracic acid, Lewin found that boracic acid stops the pathological immigration of blood-cells into the tissue of exposed membranes and parenchymatous organs, after direct application upon the exposed organ as well as probably after hypodermatic injection. What he gives in regard to the use of boracic acid in surgery, ophthalmology, and otology is well known.

(13) If a tuning-fork, placed on the teeth or vertex, is heard better on one side it does not prove, according to SEXTON, that one of both auditory nerves is affected, but shows that the better ear excludes wholly or partly the conduction through the tissues. Is the conduction of sound normal on one side, but impeded on

the other, the conduction through the air is without effect in the diseased ear, whereas the tuning-fork, put to the vertex, is heard better in the affected ear and almost not perceived in the healthy ear. In an affection of the labyrinth with normal middle ear the tuning-fork is, if at all, heard best through the air-conduction, the bone-conduction being abolished. Therefore the tuning-fork is of less value for the differential diagnosis, than it was supposed.

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(14) EITELBERG uses successfully thin, in a later stage thicker, drainage-tubes, without any other medication, acting only by pressure, in idiopathic circumscribed inflammations of the auditory canal and in those swellings of the aural canal caused by retention of discharges in the middle ear. Massage, in a more limited sense, *i. e.*, rubbing and pressing the mastoid process with thumb and index in the direction of the line of insertion of the auricle, was used in acute and subacute catarrh of the middle ear, when roaring, subjective noises, and headache coexisted. The author concedes, however, that this application may only be recommended as a palliative against headache and vertigo. Subjective noises are only distinguished for a short time, but increased if massage is continued any longer. Several cases explain it (10).

(15) ZAUFAL saw good results from massage of the ear in three cases: a chronic eczema, with thickening of the auricle, healed after striking the auricle and the lateral region of the neck. In an infiltration of the insertion of the sterno-cleido mastoid muscle after otorrhœa, ice was applied in vain, but after the first massage an amelioration was noticeable. In a third case a deep purulent infiltration under the sterno-cleido mastoid muscle decreased after massage, repeated several times, which did not cease after opening of the mastoid. Zaufal recommends massage also in affections of the tympanic cavity, and tried even the massage of the cartilaginous tube.

(16) In cases of aural hemorrhage, bone-conduction, condition of drumhead, disturbance of equilibrium, vomiting, subjective noises have to be considered in the prognosis, according to Hedinger. The quantity of blood indicates neither its seriousness nor the place of its origin.

(17) ANDREWS describes four cases of otitis media purulenta, complicated with cranial abscess, ending fatally (except one), in which the ophthalmoscopic examination showed inflammation of the optic disc. In the following discussion some, especially Kipp

and Knapp, communicated their experience in regard to the value of the ophthalmoscopic examination in such cases. They all agreed, that neuritis optica makes its appearance only when complications of the brain are established which do not always end fatally.

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(18) A son of a farmer was stabbed in his left ear with a knife. The injury was followed by a considerable outflow of blood from the ear, mouth, and nose. After a few hours he vomited a considerable quantity of swallowed blood. A horizontal wound, extending from outward and forward, inward and backward, led into a canal piercing the anterior wall of the tragus, behind the maxillary joint, proceeding into the pharynx. The wound healed by first intention. Pain in deglutition and a small partial anæsthesia of the face soon subsided. After a fortnight there was only some roaring, but it became very violent after six weeks, and was followed (according to the patient's statements) by almost complete deafness. As the case led to a forensic examination, and the medico-legal examiner pronounced his complaints simulation, the injured was accused of perjury, and came under the observation of BEZOLD, for expert testimony, nine months after the injury. B. found the external meatus normal, with exception of the scar; all symptoms of a deeply sunken drumhead with immobility, normal pharyngeal opening of the tube, absolute impermeability for air, and a firm closure 14 mm. above the opening, ascertained by a whalebone probe; great diminution of hearing. It represented a cicatrization with absolute closure of the tube by traumatic lesion of continuity. The author discusses in detail the anatomical conditions for such an injury, and thinks this hemorrhage to be caused by a lesion of the carotis interna.

(19) In the first of the two cases, given in detail by MÜLLER the chief symptoms are: affection of the sensitive portion of the right trigeminus nerve and paralysis of the gustatory fibres of the anterior two thirds of the right half of the tongue. Since the motor fibres of the third branch are free, the disease can only affect the sensitive portion of the ganglion Gasseri, or be situated more central, the trophic fibres for eye and ear being intact. The chorda fibres are of course also affected, as running within the trigeminus toward the centre. The second case is a paralysis of the three branches of the left trigeminus, which produced a neuroparalytic ophthalmia and otitis. An affection of the right tri-

geminus followed, with roaring and pain in the ear. But there was no reason to take it for a neuromyolytic otitis in the right ear, because Dr. Oscar Wolf found previously a depressed drum-head, and there was a considerable paralysis of the muscles of the tube. Müller considers the ganglion Gasseri as the seat of the paralysis, (on the left as well as on the right side,) and thinks that otorrhœa was brought about by paralysis of the trophic fibres, starting from there, as in Hagen, Berthold, Baratoux, and Kirchner's cases, after cutting the trigeminus.

(20) LUCÆ describes the spray ("Wasserstrahlgeblässe") used for the air-douche at the Berlin ear clinic. The air-pressure of the apparatus can be regulated, and a variably strong and constant current of air is obtained for the air-douche. Lucæ uses it for catheterism and Politzer's method.

(21) NORREL examined 491 children; 72 had diminution of hearing in both ears, 53 in one ear. S. M. BURNETT.

(22) LEE examined 110 pupils of the Liverpool Institute for Deaf-Mutes, in regard to their acuteness of sight; 64 were emmetropic. Of the remaining 46: 30, hypermetropic; 3, myopic; 2, anisometropic; 11 other errors of refractions; corneal opacity, 2; cataract, 2; chorioiditis, 1; retinitis pigmentosa, 6. Color-blindness in none of the 58 cases. Only in two cases distinct signs of hereditary syphilis. The six cases of retinitis pigmentosa were connected with congenital deafness, and came from four families. In two of the families the parents were blood-relations. No congenital syphilis in any of these cases existed. The author recommends to examine the visual disturbances of the deaf-mutes, and to remove them if possible.

(23) BIRCHER thinks, from his investigations and inquiries on the presence of deaf-mutism in Switzerland, that the division into congenital and acquired deaf-mutism is wrong, and distinguishes a sporadic and an endemic deaf-mutism. In Switzerland deaf-mutism has an endemic spreading parallel to the endemics of struma. Bircher showed that these endemics are related to geological formations of the soil; they occur only on marine deposits of the trias and tertiary epochs. The primitive mountains, the sediments of the Quaternary sea and of the fresh waters are free of them. According to extensive examinations in Swiss institutions of deaf-mutes, Bircher concludes, that in Switzerland about 20 % of all deaf-mutes belong to sporadic, 80 % to endemic, deaf-mutism. He believes, that intrauterine alterations of the

centres of hearing and speech occur under the influence of the endemic pathological conditions. The endemic deaf-mutism may be congenital or acquired in the first years of life. In regions of endemic deaf-mutism the disturbance of speech prevails over the disturbance of hearing, so that the defect of speech might be supposed to be a consequence of a primary affection of the centre of speech. It has to be left undecided, whether in endemic deaf-mutism the rod-shaped micro-organisms are essential, which Bircher found in the springs of districts abundant in goitre, and which were wanting in the wells of regions free of goitre.

EXTERNAL EAR.

24. W. W. SEELY. A case of primary epithelioma of the auricle. *Trans. of the Am. Otol. Soc.*, 1883.

25. G. P. FIELD. Exostosis eburnea in external meatus. Removal with the American dental machine. *Brit. Med. Fourn.*, Nov. 24, 1883.

26. Dr. KÜPPER, of Elberfeld. Communication from practice. *Arch. f. Ohrenh.*, vol. xx., p. 167.

27. Dr. C. J. BLAKE. Accumulations of epidermis in the external meatus. *British Med. and Surg. Fourn.*, May 11, 1883.

28. S. SEXTON. A case of excessive itching in external canal during ten years, without local affection (pruritus auris). *Med. Record*, Dec., 1883.

29. Dr. CZARDA, Prague. A new ear-tampon improving the the hearing. *Wiener med. Presse*, No. 16, 1883.

30. THOMAS BARR. Practical remarks on the value of Yearsley's cotton pellet as an artificial drumhead. *Brit. Med. Fourn.*, Oct. 13, 1883.

31. H. KNAPP. Unsuccessful attempt to reopen an aural canal closed after cauterization with concentrated sulphuric acid. These ARCHIVES, vol. xii., p. 154.

(24) SEELY'S patient, a man of sixty years, had his right ear bitten by a rat six years ago. The wound did not heal, but was gradually transformed into a large ulcerating growth, occupying the upper and posterior part of the ear. The whole auricle was removed with Paquelin's thermocautery. Nothing is said about the microscopic condition of the growth. S. M. BURNETT.

(25) FIELD'S patient suffered from otorrhœa for twelve years

after measles. The eburnean exostosis started from the posterior wall of the ear-canal, showed a rapid growth, and was operated upon with the American dental engine. The hearing improved after the operation, which lasted thirty-five minutes, and the secretion became less. Nothing is said about the condition of the ear-canal after the operation.

(26) Epilepsy caused by foreign bodies. A girl, eighteen years of age, suffered from pains in her right ear, beginning six weeks previous to observation, followed by abundant suppuration. Three weeks ago she put a piece of a root-wood into the same ear, in order to remove her toothache. She suffered since from frequent typical epileptic fits. KÜPPER himself observed one of them. The otorrhœa ceased after having removed a quantity of polypi on the first day, and on the second day the deep-seated foreign body, a hard piece of wood, 1 cm. long, by means of a hook (in narcosis). After the removal two epileptic fits occurred, but no further.

Symptoms of irritation of the brain by an epidermis plug. A lady, seventy-six years old, suddenly fell sick with headache, vertigo, vomiting, violent convulsions of the face and limbs, and pains in the right ear. All organs healthy, right ear deaf, external canal completely obstructed. On the attempt to remove the plug, vertigo, vomiting, and convulsions set in, which repeated later. The symptoms did not return after removal of the plug, which showed different layers of pavement epithelium. The drumhead was united with the wall of the tympanic cavity. The acuteness of hearing remained 0 after the removal.

(27) In the very rare cases in which the epithelial mass fills the canal, being fully degenerated in the centre, so that it is impossible to grasp the mass, or a part of it, with the forceps, BLAKE pierces a probe, covered with cotton immersed in caustic potash, into the substance. This transforms it into a soluble soapy substance, which is easily removed with the syringe. This procedure has of course to be repeated several times.

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(28) In this case SEXTON seems to have supposed that the cause was in the nervous centres with excentric projection through the aural branches of the V. pairs. The application of collodium cantharidatum upon small surfaces seemed to remove the trouble for some time.

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(29) CZARDA twists a piece of cotton, presses its concavity

flat, and introduces it into the defect of the drumhead by means of the speculum. It acts as porte-remède, and as artificial drum-head in cases where his silk tympanum does not answer the purpose—*i. e.*, where a certain amount of fluid seems to be necessary for the artificial drumhead.

(30) The advantages of Yearsley's cotton pellet over Toynbee's artificial drumhead are : (1) The former is softer and acts with less irritation. (2) Proper astringents or other remedies can be applied with it. (3) It does not cause any disagreeable noises. (4) It can not be seen in the external orifice.

MIDDLE EAR.

32. Dr. BEZOLD, of Munich. The closure of the Eustachian tube, its physical diagnosis and influence upon the function of the ear. *Berliner klin. Wochenschrift*, No. 36, 1883.

33. LITTON FORBES. On the indications and the therapeutic value of myringotomy. *Brit. Med. Jour.*, Oct. 27, 1883.

34. Prof. F. GRUBER. Clinical contribution concerning the tenotomy of the tensor tympani. *Monatsschr. f. Ohrenheilk.*, No. 7, 1883.

35. Dr. WEBER-LIEL. Observations and therapeutics of aural vertigo. *Monatsschr. f. Ohrenheilk.*, No. 11, 1883.

36. R. C. BRANDEIS, of New York. A case of objective noises in both ears, with synchronous movements of the drumhead and the palatal muscles. These ARCHIVES, vol. XII., p. 14.

37. Dr. JACOBY, of Breslau. Acute otitis media, with lardaceous infiltration of the mastoid region, and retention of pus in the antrum. *Arch. f. Ohrenheilk.*, vol. xx., p. 183.

38. SAMUEL SEXTON. Aural pain in children. *Med. Record*, May 5, 1883.

39. Dr. BERG, of Ulm. An observation of a complete congenital fistula colli media. *Virchow's Arch.*, vol. xcii., 1883.

40. Dr. MÉNIÈRE. Rheumatism of joints, commencing in the ear. *Revue mens.*, No. 11, 1883.

41. Dr. A. MAGNUS. A case of complete transient deafness. *Arch. f. Ohrenheilk.*, vol. xx., p. 171.

42. Dr. MOURÉ, of Bordeaux. Probable fracture of the ossicula from an indirect violence. *Bulletins et Mémoires de la société française d'otologie*, etc., vol. i., p. 87.

43. Dr. ESCHLE. Bacillus tuberculosis in the discharge of purulent otitis media in phthisical persons. *Deutsche med. Wochenschr.*, No. 30, 1883.

44. Dr. HESSLER, of Halle. Contribution to the pathology and therapeutics of perforations of Shrapnell's membrane. *Arch. f. Ohrenheilk.* vol. xx., p. 121.

45. Dr. ROOSA. A lecture on the treatment of chronic purulent otitis media. *New York Med. Journal*, March 19, 1883.

46. Dr. POMEROY. A case of chronic otitis media suppurativa, illustrating the action of boracic acid. *The Planet*, July 15, 1883.

47. H. KNAPP. A case of very obstinate otitis media desquamativa, with final recovery. *Transact. of the Amer. Otol. Soc.*, 1883.

48. C. H. BURNETT. Affection of the mastoid. Artificial opening of the bone. Temporary relief. Death by pyæmia. *Trans. of the American Otol. Soc.*, 1883.

49. L. TURNBULL. Observations on caries of the mastoid in children. *Philadelphia Med. Times*, July 14, 1883.

50. W. F. MARTIN. A case of mastoiditis leading to phlebitis, with fatal issue. *New York Med. Times*, August 1883.

51. H. KNAPP, New York. Three serious cases of mastoid disease, with remarks. *These ARCH.*, vol. xii., p. 44.

52. E. TILDEN BROWN, New York. A case of abscess of the mastoid, etc. *These ARCH.*, vol. xii., p. 57.

(32) See above the physiological report by WOLF.

(33) FORBES discusses in detail the indications for myringotomy, which he wrongly terms myringodectomy (excision of the drum-head). He recommends a free incision, extending over the whole diameter of the drum-head. The indications given by him correspond in their essential parts to those generally accepted.

(34) GRUBER believes that the great importance of tenotomy of the tensor tympani has not nearly found its deserved acknowledgment. He has, as he states, performed the operation in relatively many cases with more or less good result.¹

After Weber-Liel had alleged that vertigo, caused by affections of the ear, could be removed through tonotomy of the tens. tym., the operation was performed by the author in such a

¹ Pollack saw Prof. Gruber perform the operation only once, during the five years while he was studying otology as assistant of the ear clinic of Vienna. *Allgem. Wien. med. Zeitung*, February, 1880, No. 46, ff.

case. The tinnitus disappeared after the operation. The watch, perceived before only on immediate contact, was heard at 28 *cm*. Violent fits of vertigo occurred directly after the operation and during the next days, disappearing after the healing of the wound in the drumhead.

(35) WEBER-LIEL reports a case where violent attacks of vertigo were permanently removed by tenotomy. The symptoms of vertigo were caused by a fall upon the occiput with hemorrhage from the ear which subsided after three weeks' confinement; they were so violent that the patient had to be supported. Energetic rarefactions of air in the external meatus produced a diminution of the noises and of the sensation of giddiness. The latter was entirely gone, immediately after the operation, without returning.

(37) An otherwise healthy and strong girl, nine and a half years of age, had purulent discharge from the left ear for three weeks, with pain for eight days, and for more than a week painful swelling of the mastoid region. In the meatus, which was swollen and narrowed, some offensive pus; small perforation, pain in the mastoid, vertigo in horizontal position. Paracentesis, antiphlogosis, and iodine applications not removing the offensive pus during five weeks after the beginning of the observation, a needle was thrust into the mastoid antrum, 2 *cm*. deep, after which some drops of viscid bloody pus were evacuated. An incision of the swelling down to the bone on the next day discovered no pus, but only compact lardaceous infiltration, detachment of the periosteum, and some roughness of the bone. Eight days later a deep incision was made in the swollen posterior wall of the meatus, and the paracentesis repeated. Purulent infiltration and necrotic exfoliation of the infiltration took place within the next weeks, and in six months a complete cicatrization was established, remaining constant for two years in spite of a relapse of otitis media, caused by an acute nasal catarrh. The hearing is of course as much injured as before.

(The many small operations, the considerable disturbance of function might have been avoided by an opening of the mastoid at the proper time, and the duration of the disease essentially abbreviated.—REVIEWER.)

(38) SEXTON sees no great advantage in leeches for the treatment of acute inflammations of the ear in children. He considers myringotomy seldom necessary, but puts great confidence upon the internal use of aconite, gelsemium, pulsatilla, and sulphide of calcium(!)

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(39) BERG found in a recruit a fistular opening right above the incisura thyreoidea, leading into a canal 1 *cm.* deep. After splitting the canal to the median line another one presented, going right into the depth, 3 *cm.* long (just below the hyoid bone); the pharyngeal ostium could not be discovered with the probe nor with the laryngoscope. This fistula discharged since birth a viscid mucous fluid and transmitted distinct gustatory perceptions, on injections of different fluids. From his eighth to his fourteenth year the discharge from the orifice in the neck is said to have sometimes stopped, being substituted by a purulent offensive otorrhœa. At the attempt to obliterate the fistula by the galvanocautery, a stinging pain, and after two days otorrhœa set in. The otitis externa et media soon became regressive, the drumhead showed afterward retraction and opacity. The external parts of the ear were regularly developed. The author considers the first and the third visceral fissure as the origin of this malformation, in consequence of an arrest of development, since the fistula led to the depths below the hyoid bone which develops from the third visceral arch.

(40) MÉNIÈRE reports a case of acute rheumatism, introduced by an affection of the middle ear. An otherwise healthy man of thirty years was attacked with chills and violent pain in the right ear, which showed slight remissions from time to time. The drumhead lacked its lustre, was opaque, bulged forward, without injection of the vessels. In spite of antiphlogosis, neither perforation nor amelioration of the supposed otitis media occurred; but acute rheumatism on the fourth day, and then the aural affection improved rapidly. He mentions a similar case where rheumatic pains in the legs changed with aural pains, without the drumhead showing any abnormality; and a second one, in which a few days before the outbreak of acute rheumatism an alternating œdema of both mastoids appeared, with violent pain in the ear, which soon disappeared.

In the discussion GELLÉ mentioned a woman who suddenly was seized by a violent Ménière attack, substituted by an attack of asthma after eight days. Three weeks later an attack of gout set in, which was said to have begun in the same way ten years ago.

(41) A delicate boy, apparently hereditarily and neuropathically affected, nine years old, having suffered from various attacks of vertigo, once parotitis, frequently bronchitis, suddenly fell ill with difficulty of hearing. He improved under a catheterization, performed by another surgeon, which was difficult on account of a

deformity of the nasal septum, when suddenly complete deafness occurred in the right, and almost complete in the left ear. The objective examination of the drumhead, tube, naso-pharynx, showed no essentially morbid changes ; bone-conduction absolutely destroyed. No symptom of a central affection or tuberculosis of the brain ; a violent eclamptic fit occurred during observation. The treatment consisted in roborating diet. A few days later perfectly normal hearing returned in both ears, after a violent movement, with pain in the right ear and the sensation as if something was torn. Patient said that on the next day he had the sensation as if he had swallowed something hard and offensive.

The author considers the different diagnostic possibilities, but does not believe that a complete obstruction of a tube could produce such perfect deafness with abolition of bone-conduction in both, and thinks it not to be impossible to pronounce the whole trouble as a nervous affection on an anæmic hysteric basis. Similar disturbances in the further course of the boy's condition were in favor of this explanation.

(42) The patient, observed by MOURÉ, while pushing railway-coaches, received a double shock at the right parietal and left mastoid regions. He became unconscious, bled from both ears, especially from the right, and recovered after a long time, but was deaf. He exhibited a paralysis of the right facial nerve, a certain dulness and reduction of intellect. He does not hear the speech at all with the right ear ; with the left a little. Bone-conduction destroyed on the right ; very much reduced on the left. Subjective noises, often violent vertigo, exist without disturbance of consciousness. The right meatus is normal, the drumhead deeply depressed, nearly immovable, of normal color in front. The hammer is entirely deviated ; behind and parallel with it, there is a linear scar, the consequence of a rupture of the drumhead caused by the injury. Behind and above a small grayish-yellow ossified place, representing a callus from a fracture of the ossicula. The left drumhead is somewhat thickened, but without a cicatrix. From the description the reviewer is not convinced that there was a fracture of the ossicula. The condition corresponds more to a bulging forward of the joint between incus and stapes.

(43) ESCHLE found, without exception, bacilli tuberculosis, three to eight in each field, in about twenty-five preparations of the aural discharge of a phthisic person, who suffered from

purulent otitis media sin. for several weeks. Stained with fuchsin according to Ehrlich's method, they became very distinct. Besides, the same patient furnished the appearance of blue pus, probably in connection with the same secretion of a patient in the same ward suffering from bed-sore.

The second case of Eschle is a boy who fell ill successively with scarlet-fever, nephritis, diphtheria, and suppuration of the lymphatic glands of the neck. He came under treatment on account of a suppuration of the left middle ear existing for several months after scarlet-fever. Perforation of the drumhead of the size of a pin's head, miserable appearance, no pulmonary disease evident, yet there were bacilli in the aural discharge. The perforation healed with a depression after one month's treatment, myringitis and chronic otitis media continuing; bacilli in the discharge. The appearance not improved in spite of roborating treatment and good care.

(44) HESSLER, following Morpurgo, thinks that the essential feature of otorrhœa with perforation of Shrapnell's membrane is a suppurative process of the cavities around the neck of the hammer, the communication of which with the remaining portion of the tympanic cavity is stopped. According to that, he directs his treatment, using injections through the catheter, where the diseased parts can be reached from the tube. Since the probe reveals mostly caries of the hammer or of the opposite wall of the meatus, he treats this exactly according to the rules of surgery with nitrate of silver or galvanocautery. He uses the latter also for dilatation of a too narrow perforation. In those cases in which the above-mentioned place does not communicate with the tympanic cavity, he dilates the perforation by removal of the whole of Shrapnell's membrane, and makes a second opening in the posterior half of the drumhead with the galvanocautery, so that the hammer is almost or, if necessary, entirely separated.

(45) ROOSA has not as yet reached the point of rejecting the syringe, properly and carefully used, as a means of cleansing the ear, nor excludes the so-called dry method. He considers the solutions of sulphate of zinc and alum, one to four grains to the ounce, the most useful. In order to remove granulations, he uses fuming nitric acid, chromic acid, and nitrate of silver in solutions of twenty to sixty grains to the ounce. He thinks alcohol to be valuable.

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(46) From a pretty extensive experience about the use of boracic

acid, POMEROV is an enthusiastic advocate of its use in chronic suppurative otitis, where neither polypi nor granulations exist. Where there are granulations, boracic acid remains without effect until they are removed. He uses nitrate of silver in strong solutions or in substance (melted to the point of a probe), in order to remove them.

(47) The purpose of KNAPP's paper, in which the clinical history of a single case is given in detail, is to show, that a torpid desquamative inflammation of the mucous membrane of the middle ear may be treated most successfully by stimulation, tending to transform it into an acute one. Knapp used pellets of cotton, impregnated with glycerine and nitrate of silver. This caused the growth of polypi, which could be removed. After their removal the disease healed with restitution of the drumhead and good hearing.

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(48) There was otitis media chronica purulenta with hyperostosis of the outer wall of the mastoid and increased vascularity of the pyramid of the temporal bone. The mastoid antrum was filled with a cheesy mass, constituting the focus of a pyæmic affection, leading to abscesses in the lungs, and later, in the liver. The opening of the mastoid process made the local symptoms temporarily disappear, but had, of course, no influence upon the pyæmia. The case is given in great detail. A discussion followed on the opening of the mastoid. Among those who advocated the operation were: Knapp, Kipp, Grüning, whereas others, Strawbridge, Theobald, Sexton, Burnett, and Holt thought the operation was only seldom indicated.

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(49) L. TURNBULL first makes some general remarks upon the nature of the affection and the usual methods of treatment. Then follows in detail a report of a case of encephaloid cancer, affecting the temporal bone, the mastoid cells, and the antrum, presenting itself at first as a polypoid growth from diseased bone in the osseous external meatus. The boy was four years old. The tumor was removed three times, relapsed each time, and ended fatally.

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(50) MARTIN's patient, a boy seven years of age, had purulent discharge from the right ear for several years. During an acute attack the mastoid became painful again and swelled. Soon followed discharge of offensive pus from the meatus, together with swelling of the neck, forehead, and eyelids. There was exophthalmus and congestion of the conjunctiva. The parts round the

jugular vein were hard and tender. Temperature 104° F. The patient died at the eighth day. No post-mortem.

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Nervous Apparatus.

53. Drs. G. LEMOINE and M. LANNOIS. On complete one-sided and double deafness after parotitis. *Revue de Médecine*, vol. iii., Sept., 1883.

54. Dr. D. B. ST. JOHN ROOSA, New York. The affections of the ear in the course of parotitis. *These ARCH.*, vol. xii., page 1.

55. Dr. HODGSON, Brighton. Four cases of nerve-deafness. *Brit. Med. Journ.*, Sept. 29, 1883.

56. DAVID WEBSTER. A case of syphilitic disease of the labyrinth with poisoning with bromide of potash. *The Planet*, April 15, 1883.

57. Dr. C. MIOT. Reflex deafness; recovery. *Revue mens.*, No. 9, 1883.

53. LEMOINE and LANNOIS add an observation of their own to a careful review, given in detail, on all published cases of mumps-deafness.

A soldier, twenty-three years of age, was seized with disorders of general health, intense pain in ear and head, violent roaring and other subjective noises. On the fourth day, during an epidemic of mumps, double parotitis and deafness set in. The different theories for the explanations of mumps-deafness are given and rejected, and the disease is considered by the authors, according to Moos, as a general disease, localizing itself commonly in the salivary glands, sometimes in the testicles, and seldom in the prostate, breast, etc., and in the labyrinth.

(55) HODGSON gives the following cases of nerve-deafness: (1) Labyrinth deafness after mumps. A boy of fifteen years was affected with orchitis on the sixth day of mumps. When the orchitis was subsiding, headache, severe vertigo, roaring, and one-sided deafness occurred. The deafness was complete and remained permanent. (2) Labyrinth-deafness after mumps. A girl of fifteen years had suddenly become deaf, two years before, during mumps. Headache, vertigo, and roaring did not exist. (3) Labyrinth-deafness from hereditary syphilis. A girl, ten and a half years of age, became perfectly deaf within twelve months. The incisors had the characteristic appearance of that affection.

In the 4th case there was also complete deafness on both sides, caused by hereditary syphilis.

(56) The chancre was observed in 1865. In October, 1876, deterioration of hearing was first noticed, without subjective noises. Pharynx, external and middle ears, in good condition. Left ear perfectly deaf in November. Right, H.D. $\frac{3}{8}$. Inunctions of blue ointment, and large doses of bromide of potash were ordered, in order to obtain sleep. Bromism developed, disappearing after discontinuing the remedy. Then iodide of potassium in large doses was taken. In January, 1877, the watch could be heard by immediate contact on the left side, and the disagreeable head symptoms disappeared. S. M. BURNETT.

(57) A girl, fourteen years of age, fell sick with various nervous complaints, which had to be ascribed probably to disorders of menstruation, with roaring and a high degree of difficulty of hearing on the right, and moderate diminution of hearing on the left. After removal of a large plug of cerumen, a certain amount of improvement began, although perfect recovery was effectuated by the induction current. The air-douche was not used. MIOT proposes some peculiar terms for the test of hearing.

Nose and Naso-Pharynx.

58. W. F. WALSHAM. Nasal stenosis as a cause of chronic nasal and naso-pharyngeal catarrh. *Lancet*, p. 1121, 1883.

59. DEMME, Bern. On the diagnostic significance of bacilli tuberculosis in infancy. *Berliner klin. Wochenschrift*, No. 15, 1883.

60. HOPMANN, Cologne. On the nomenclature of tumors of the mucous membrane of the nose. *Wiener med. Presse*, No. 38, 1883.

61. HACK, Freiburg. Rhinological controversies. *Fortschritte der Medicin*, No. 20, 1883.

62. M. DEPRÈS. Foreign bodies in the nose. *Gazette des hôpitaux*, July 31, 1883.

63. BARATOUX. Necrosis of the nasal bones. Expulsion of the central part of the sphenoid bone. *Revue mens. de laryng., d'otol.*, etc., No. 8, 1883.

64. BARATOUX. Contributions to the study of the diseases of the naso-pharynx. Adenoid excrescences. *Revue mens.*, No. 12, 1883.

65. R. E. SWINBURNE. Adenoid excrescences in the nasopharynx and their relations to affections of the middle ear. *Med. Record*, Oct. 6, 1883.

66. GELLÉ. On chronic rheumatic angina, etc. *Revue mens.*, No. 12, 1883.

67. TH. SCHECH, of Munich. The diseases of the neighboring cavities of the nose and their treatment. Munich, 1883.

68. J. HABERMANN, of Prague. Massage for chronic facial œdema after habitual erysipelas. *Prager Med. Wochenschr.*, No. 40, 1883.

69. W. F. WALSHAM. On an easy method of posterior rhinoscopy. *Lancet*, 1883, page 142.

70. F. CHRISTMAS, Dirckinck-Holmfeld of Copenhagen. Experimental investigations on the construction of the regio olfactoria; with a plate. *Nordiskt med. Arkiv.*, vol. xv., issue 3, 1883.

(58) WALSHAM discusses the frequent occurrence of the diminution of the lumen of the nose by deformities of the septum and hypertrophy of the turbinated bones. Both may be the causes of chronic nasal catarrh. Walsham confirms Delavan's experience, that, in cases of bending of the septum to one side, hypertrophy of the turbinated bones of the opposite side exists. The treatment of the deformities consists in adjustment by cross-wise incision into the cartilage. In general hypertrophy of the inferior or middle turbinated bones, the bone can easily be removed by means of a polypus-forceps. Walsham experienced neither danger nor trouble from this operation.

(59) DEMME found a group of small yellow tubercles and ulcers at the septum as the cause of ozæna scrophulosa infantum in a boy eight months old, suffering from it for two months, who had neither hereditary syphilis nor a tuberculous affection. He found in the secretion of the nose more or less bacilli tuberculosis. Shortly after this observation an acute meningitis supervened, leading rapidly to death. The *post-mortem* examination revealed tuberculous basilar meningitis; all other organs were free. In the tubercles and ulcers of the nasal mucous membrane, taken from the corpse, the bacilli were in moderate number, free or in giant cells. Demme thinks it probable, that the tuberculous affection of the nose produced meningitis along the vessels. The nasal affection possibly was brought about by infection from the phthisical step-father of the child. On examina-

tion of some cases of common scrophulous rhinitis in children Demme did not discover any bacilli tuberculosis.

(60) Compare above Steinbrügge's report.

(61) HACK asserts that a great number of exudative so-called rheumatic affections are produced by reflex irritation of vaso-dilatator nerves from an irritability of the nose, caused by slight affections. The circumscribed, transient œdema in the face of some individuals, due to a cold, belongs to this category. In some cases he experimentally produced it by irritation of the mucous membrane of the nose, and could remove it permanently by destruction of the membrane, as well as the inclination to painful stiffness of the neck, which he found repeatedly in connection with affections of the mucous membrane of the nose, and which is not due to a contraction but to an exudation, as shown by rheumatic muscular callus. The scotoma, caused by a cold, and the transient amaurosis, seldom produced by the same cause, which he cured by removal of irritations of the nose in some cases, are brought about, according to the author, by the reflex swelling of the optic neurilemma, and the neuralgia, observed by him and others in acute coryza, is caused by hyperæmia and swelling of the neurilemma, an explanation in harmony with the views of neurologists on neuralgia. The rheumatic exudations in different joints are caused in the same way, sometimes simultaneous with the œdema above described, sometimes with acute coryza, or as a consequence of a nasal operation, as vaso-dilatator exudations in consequence of nasal irritations. (The mucous membrane of the urethra, exposed more rarely to irritation, shows an analogous sensitiveness : exudations into a joint after catheterism.)

The author believes that it cannot be decided yet of what nature this irritation of the mucous membrane of the nose may be, and how it is connected with the catarrhal affections or the neoplasms, but he declares that all these so-called rheumatic affections may be successfully treated in a surgical way.

62. DESPRÈS discusses the different methods of removing foreign bodies from the nose, and calls attention especially to the danger, arising from the fact, that a foreign body pushed backward might enter the larynx. For extraction he commends a curette, provided with a joint, according to Le Roy d'Etiolles. The instrument has to glide gently under the foreign body to the posterior wall of the pharynx, being constantly in contact with the nasal floor. The curette has now to be bent in an angle and

drawn back, in order to remove the foreign body. (The removal is performed more simply, more certainly, and more agreeably for the patient by means of any hook-shaped probe.—REV.)

63. BARATOUX gives in detail a case of a high degree of destruction of the osseous frame of the nose, caused by syphilis. The offensive discharge, existing for years, was stopped by removal of a sequestrum, belonging to the middle part of the ethmoidal bone.

64. BARATOUX describes the well-known symptoms of adenoid excrescences of the naso-pharynx. He says, that only by the posterior rhinoscopy an exact diagnosis can be obtained, and he illustrates this by a case where a patient, exhibiting the symptoms of an enlarged tonsil, was operated upon by another physician with a forceps, although all the symptoms were really brought about by an excessive hypertrophy of the posterior end of the right inferior turbinated bone. A profuse hemorrhage, which could only be stopped by tamponade, followed the fourth sitting. Baratoux discovered by rhinoscopy not only the above mentioned pathological conditions, but saw that the hypertrophic end of the turbinated bone, as well as the tubal ostium, the mucous membrane of the roof of the pharynx, and the nasal septum were extensively lacerated. Baratoux recommends galvano-cauterization for treatment.

65. SWINBURNE finds adenoid excrescences at an average of one to six and a half of his patients suffering from diseases of the middle ear. He prefers Jarvis' snare to every other method for removal. Next is the galvano-cautery. S. M. BURNETT.

66. GELLÉ has very often seen a very marked pharyngitis, not very troublesome, in people suffering from gout or rheumatism, with a remarkable tendency to affections of the ear. This affection is not limited to the mucous membrane, which becomes glittering, folded, and thickened, but is accompanied by œdema of the submucosa, so that the pharyngeal cavity becomes considerably narrowed. In connection with this he has sometimes noticed tin. aur., chronic catarrh, and especially Ménière's complex of symptoms; the vertigo, as well as the tinnitus, diminished or disappeared entirely with the amelioration of the pharyngeal symptoms. (The establishment of an "angine rhumatismale" does not seem to be legitimate.—REV.)

67. SCHECH discusses in detail the diseases of the neighboring

cavities of the nose, the antrum Highmori, frontal, sphenoidal, and ethmoidal sinus, without giving any new points.

67. HABERMANN applied massage successfully in a case of chronic nasal catarrh and a case of ozæna, accompanied by a high degree of thickening of the tip of the nose, the upper lips, cheeks, and eyelids. In opposition to Hack, he considers the single attacks of erysipelas, leading to chronic œdema, as typical affections, caused by bacteria, and the rhagades at the mouth, existing in both cases, as the possible ostia of infection.

(69) WALSHAM recommends as an easy method of posterior rhinoscopy to push an india-rubber tube through the nose, and when it appears under the velum, to draw it out from the mouth with a pair of forceps, and to bring the soft palate forward. Then a free view into the choanæ is easily obtained, without causing any trouble to the patient. The india-rubber tube is better than the tapes recommended by American surgeons. (The author does not seem to know that Türk used this method.)

(70) The author ventilates the question again, whether the epithelial cells or the olfactory cells have to be considered as the real terminal organs of the olfactory nerve (M. Schultze and S. Exner). He made experiments on rabbits, guinea-pigs (*cavia cobaya*), and frogs (*rana esculenta*). After trepanation he separates the bulbi olfactori from their connections and removes them. In a short time (fourteen days in warm-blooded animals, one month in frogs) a destruction of the olfactory cells is visible. They become filled by fat granules, and the processes disappear. In four or five months the middle cells begin to degenerate in warm-blooded animals. In frogs the author saw no change in these cells. The frogs are only to be used in the summer months on account of the very slow circulation. The results of the author are :

1. The olfactory cells have to be considered as real terminal organs of the olfactory nerve.

2. The epithelial cells cannot be in direct connection with the olfactory nerve.

3. M. Schultze's assertion about the organization of the mucous membrane of the nose is correct, and the observations of S. Exner are not.

VICTOR BREMER.

MISCELLANEOUS NOTES.

We heartily recommend a new text-book on Otology which appeared a month ago, namely : **A Manual of Diseases of the Ear**, for the use of Students and Practitioners of Medicine. By THOMAS BARR, M.D., of Glasgow. Jas. Maclehose & Co., 1884. This book has 530 small octavo pages, is beautifully printed on handsome paper, and illustrated by 115 very well executed wood-engravings. Its style is clear, easy, correct, and careful. The first, introductory, part of 152 pages, treats of *general otology*, viz. : (a) the examination of the ear, (b) the causes of ear disease, (c) the affections of the nose and throat in connection with ear disease, (d) the methods of treatment. The remainder of the book is devoted to *special otology*, with an anatomical and physiological description at the beginning of each chapter. At the end of the work are numerous formulæ of local and general remedies, with full statements of their modes of application and their indications. The book holds a happy medium between the meagre and insufficient treatises which contain the names, titles, and claims of their authors in full, but only a fraction of the subject-matter of otology, and the exhaustive and fundamenal works, of which Politzer's recent book may be mentioned as one of the best representatives. Barr's manual deserves to have a large circulation, and would undoubtedly obtain it if there had not been an overproduction of otological text-books during the last years. Diffusion of otological knowledge has been more extensive than production. H. K.

A "**Société Française d'Otologie et de Laryngologie**" has been formed in Paris. Besides the active members it consists of a number of honorary and corresponding members, mostly chosen from abroad. The Société publishes its transactions.

The **Annales des Maladies de l'Oreille, du Larynx, et des Organes Connexes**, founded in 1874 by Isambert and Krishaber, deceased, and Ladreit de Lacharrière, and since

that time regularly issued in its original form, is now to be made, under the direction of the surviving editor, an international journal, and is to be published in both French and English.

The direction and publication will remain in Paris, and the editors selected for the laryngological and otological departments respectively are : in England, Morell Mackenzie and Woakes ; in Belgium, Capart and Ch. Delstanche ; and in America, J. Solis-Cohen and Clarence J Blake.

Dr. WEBER-LIEL, of Berlin, has been appointed **extraordinary professor** of otology at the University of Jena.

Dr. J. PATTERSON-CASELS, of Glasgow, **died** in April of this year. His contributions to otology were numerous and meritorious, as our readers well know.

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THE editors and publishers of the ARCHIVES beg to offer some suggestions to authors who propose to favor them with their contributions.

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2. Authors will receive gratuitously twenty-five reprints of their articles. If a greater number is desired,—notice of which should be given at the head of the manuscript,—only the additional cost of presswork and paper will be charged to the author.

3. In preparing manuscript for the compositor it is requested that the following rules be adhered to :

a Write on one side of the paper only.

b. Write without breaks, *i. e.* do not begin a new sentence on a new line. When you want to begin a new line or paragraph at a given word, place before it in your MS. the sign ¶.

c. Draw a line along the margin of such paragraphs as should be printed in smaller type, for instance, all that is clinical history in reports of cases, etc.

d. Words to be printed in *italics*, should be underscored once, in SMALL CAPITALS twice, in LARGE CAPITALS three times.

4. Authors may receive proofs for revision if they will kindly return them without delay. We beg however to remind our contributors that changes in the copy are equivalent to resetting, causing so much additional expense. We therefore request them, to make, if possible, no alterations at all in their MSS., or, at least, to limit these to what is of essential importance.

ARCHIVES OF OTOTOLOGY.

THE EXISTENCE OF THE TUBERCLE-BACILLUS IN AURAL DISCHARGE, AND ITS SIGNIFICANCE IN CLINICAL DIAGNOSIS.

BY A. GOTTSTEIN, BERLIN.

(FROM THE POLICLINIC OF DR. ARTHUR HARTMANN, IN BERLIN.)

Translated by H. F. HANSELL, M.D., Philadelphia.

THE determination of the presence of tubercle-bacilli in certain cases of purulent middle-ear inflammation is, from several points of view, of the same importance as the discovery of its presence in the secretion and tissues of other organs. Since the existence of the tubercular inflammation of the middle ear has now been proven beyond question, a reliable clinical observation can establish the connection which exists between the tubercular ear affections and tubercular disease of other localities, especially the lungs. Moreover, the evidence of the presence of tubercle-bacilli in purulent middle-ear inflammation is of importance in determining the question as to the point of entrance of acute or chronic tubercular disease to within the skull. Thus far the well-known observations of Weigert and the case of Demme¹ have proven only one point of entrance—the nostrils, when they were the seat of tubercular disease. After the bacilli have been discovered in the middle ear there is no obstacle in the way of supposing they can make that the entrance-point and produce a tubercular affection of the contents of the skull.

The difficulty, however, here as in other cases lies in the possibility of adducing proof of the bacillus for clinical diag-

¹ *Berl. klin. Wochenschr.*, 1883, No. 15.

nosis. In drawing our conclusions we must distinguish between the organs affected. While we can with safety exclude the existence of a tubercular lung affection by the absence of the bacilli in only a few preparations of a suspected sputum, the bacilli are found in such small numbers in the secretion of tubercular bone and gland diseases, and in the diseased tissues, (in the pus of a tubercular abscess they may entirely elude discovery) that König¹ and Marchand² in such cases place but small diagnostic worth in this examination.

The question presents itself, whether the discovery of bacilli in the otorrhœa is so closely connected with the existence of a tubercular disease that we are justified in excluding the existence of a tuberculous affection by the absence of the bacilli, or whether the chronic tubercular middle-ear disease is, in this respect, to be classed with tuberculous bone diseases, etc.

Notwithstanding the limited literature on the subject, it may be said with some degree of probability, in answer to the above question, that in cases of otorrhœa, the diagnostic value of the bacilli is not very great.

The first positive communication on this point was by Eschle.³ A man with advanced phthisis of the lung suffered from left-sided otorrhœa. In each one of twenty-five preparations were found bacilli in apparently moderate quantity (colored with fuchsin-anilin, and by mistake described as violet instead of red). His second case was a boy who shortly before had suffered from scarlatina, nephritis, and diphtheria, and presented a most anæmic appearance, though there was no demonstrable lung disease. After a month the perforation had healed, but there still persisted chronic otitis externa, the secretions of which contained bacilli.

Zucker⁴ has called attention in his reference to Eschle's article, to the fact that this last case presented himself a short time afterward in Dr. Hartmann's Polyclinic with total destruction of the membrane and no bacilli.

¹ *Centralb. f. Chir.*, 1883, No. 22.

² *Deutsche med. Wochenschr.*, 1883, No. 15.

³ *Deutsche med. Wochenschr.*, 1883, No. 30.

⁴ *Centralb. f. Chir.*, 1883, No. 42.

Secondly, Voltolini¹ mentions, in a preliminary communication, that for some time he has watched and called attention to cases of otorrhœa, without any apparent cause, in which either a short time afterward a perhaps previously latent, lung phthisis followed, or the same ear affection, without any bone complications, supervenes on a beginning or already improving phthisis. In one such case he was able to discover bacilli, and hence the proof of the common cause of the two affections. A more-detailed account he reserves for another communication.

As opposed to these three positive cases, Gessler,² in an elaborate paper on the presence of bacilli in different localities, expresses himself thus: "That in the secretion of cases of phthisical otitis media purulenta, which he had examined at the request of Dr. Bezold, he had been unable to discover the bacilli, but his material was too small to allow him to form any positive conclusions."

Kanzler,³ in a paper on the presence of bacilli in scrofulous local affections, says that in two cases of purulent middle-ear inflammation—one scrofulous and one tuberculous,—he was unable to prove the existence of the bacilli in the secretion of the diseased ears, although in the mucus of the inflamed larynx the bacilli were abundant.

In the Policlinic of Dr. Hartmann, a case is at present under observation, in which the lungs have been for years considerably affected. Recently a left-sided chronic purulent middle-ear inflammation has been added which, in spite of treatment, has resulted in great destruction. The examination of the sputum always revealed the tubercle-bacilli, but in the pus discharged from the ear they could never be found, although repeatedly looked for both in the pus which had collected in the external canal and that obtained after inflation.

Although only negative results were obtained by our examination of the discharge from other cases of obstinate otorrhœa in scrofulous children, and from a phthisical patient, we do not care to lay much stress on these,

¹ *Deutsche med. Wochenschr.*, 1884, No. 2.

² *Deutsche med. Wochenschr.*, 1883, No. 34.

³ *Berl. klin. Wochenschr.*, 1884, Nos. 2 and 3.

because in these cases only one examination was undertaken, although where the sputum is suspected, even that may be of value. It will not be denied, however, that the above case, judged by its clinical aspect, compels us to accept a tubercular origin, as in the first of Eschle's cases, in spite of the fact that at one time the bacilli were present and at another they escaped observation. It is self-evident that in our case also the tubercle-bacilli were the cause of the disease. Whether they themselves were present in extremely small quantities, as in Schuchardt-Krause's cases, or whether the particular conditions of the locality prevented their discovery, is uncertain. It is possible that in a large collection of preparations we might be able to find a few rods. It is probable that a piece of mucous membrane removed from the dead body and examined would give positive knowledge. At all events, in the cases in which the clinical conditions predispose us to accept the theory of the tubercular origin of the disease, it must not be at once rejected because on repeated examination of the secretion the bacilli remain undiscovered. In estimating the practical value of the examination for tubercle-bacilli in the diagnosis of a tubercular ear disease, it must be remembered that these cases in which the examinations gave negative results, and in which the tubercular origin was not less well grounded, were opposed to the three well-known cases with their positive evidence of the presence of bacilli. Hence the examination of the secretion, in all suspected cases of chronic purulent middle-ear inflammation, for tubercle-bacilli is to be recommended. If, however, the result is negative, we are not justified in excluding a tubercular origin.

ON THE CELLULAR STRUCTURES OF THE HUMAN ORGAN OF CORTI.

(ABRIDGED FROM A COMMUNICATION READ BEFORE THE NATURALISTS' CONVENTION AT FREIBURG, I. B., IN 1883.)

BY H. STEINBRÜGGE, HEIDELBERG.

Translated by H. F. HANSELL, M.D., Philadelphia.

(*With two wood-cuts.*)

N EARLY all histologists since Deiters have described the outer cells of Corti as long, cylindrical or cone-shaped formations, which, by means of a lower process, are attached to the lamina basilaris. Rosenberg, in a dissertation on the cochlea of the dog, which appeared in 1868, was the first to describe these cells as having a rounded lower end and no prolongations; and Retzius, in 1882, in an article on "The cochleæ of Rabbits," contained in his "Biological Examinations," concurred in this view. The speaker called attention to the fact that Hensen in the "Morphology of the Cochlea of Man and other Mammalia," published in 1863, had described the human cells of Corti as being spherical in shape, in contrast to the more oblong, seen in some of the lower animals; and mentioned that he had always found the outer cells of Corti in the human cochlea to be of smaller size and rounder form than they appeared in the illustrations in the histological text-books and monographs. They never showed an inferior prolongation; such may, however, be easily simulated, by the prolongations of Deiters's cells, as in their course to the lamina

reticularis to which they are attached alternately in the spaces between the outer cells of Corti, they pass closely to the outline of these and often appear to originate from them. In illustration of this condition, two preparations, among others, were exhibited, in which the outer cells were isolated and easily seen (see cuts). These cells are distinguished from the neighboring cellular structures *in natura*, by a stronger reflex, by a sharper contour, and occasionally by a darker color, and at times resemble a small ganglion cell. The spherical nucleus is often seen only through a high magnifying power. In the place of the minute ciliæ was observed generally only one rod-shaped prolongation which passed through the lamina. The other preparations

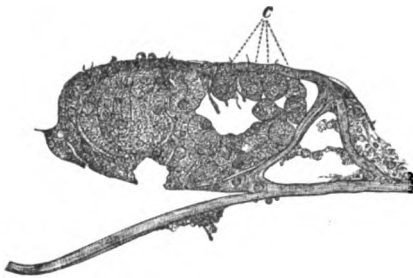


FIG. 1.

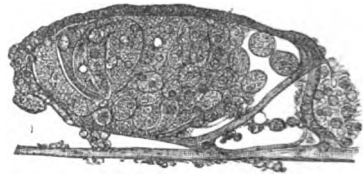


FIG. 2.

shown related to the inner cells of Corti, and the cells of Claudius and Hensen, but, having no drawings of them, I shall not notice them here.

Explanation of the Cuts.

The drawings purposely represent the preparations exactly as they are, including their defects and want of clearness. In so presenting them, we hope they will prove so much the more convincing. Any one accustomed to examine microscopically the human cochlea, will know, moreover, that regular and beautiful preparations of it are not to be obtained with the same facility, as they may be from the ears of animals. In order to be able to recognize pathological changes in the organ of Corti, a definite knowledge of the human ear is, however, absolutely necessary.

The drawings were made by Mr. C. Wittmaack, in Strassburg.

Fig. 1 (Hartn. §) shows four of the outer cells lying one behind the other (*c*), the first of which (counted from within) probably belongs to a deeper row. On the other, there is seen a rod-like projection, which proceeds from the upper margin and pierces the lamina reticularis. To the outer side of the last two cells to the left, we see the torn processes of Deiters's cells. Only the upper part of these processes which is fastened to the lamina reticularis remain, and, as they lie closely to the cells of Corti, have the appearance of belonging to those cells. To the side and below lie a few cells of Corti belonging to another row, which have been displaced by the cutting of the preparation; they have no trace of a basilar process.

Fig. 2 represents the same; only the remnants of Deiters's cells are wanting; it shows especially well the round form of the second cell of Corti.

A CASE OF DOUBLE LABYRINTHINE DISEASE AFTER
SCARLATINA ; FAVORABLY AFFECTED BY HYPO-
DERMATIC INJECTIONS OF PILOCARPIN.

BY PROF. S. MOOS, OF HEIDELBERG.

Translated by Dr. J. A. SPALDING, Portland, Me.

Nov. 22, 1881.—I first saw S. H., æt. seven, in consultation with Dr. Gernet, of Carlsruhe. The little girl had been attacked late in the previous October with severe scarlatina, which was chiefly marked by a violent, probably diphtheritic, inflammation of the throat, accompanied with and followed by an extensive infiltration and suppuration of the glands ; on both sides of the neck an incision was necessary to relieve the suffering. At the height of the disease the temperature was 40.6° C. (105° F.). There was never any loss of consciousness.

About a week after the fever began, pain was complained of in both ears, and followed by an abundant and exceedingly fetid discharge, which still persists. The hearing gradually decreased, and for the last few days before I saw the child, had been entirely lost.

Examination showed that the hearing was absolutely destroyed, both by ærial and bone-conduction. The child could not hear the loudest possible shout close to her ears. The discharge was as abundant as before, and each *Mt* exhibited a perforation embracing about one half of its extent. The mucous membrane of the tympanum was much swollen. The child, who was very bright, gave us to understand, upon questioning, that she was also suffering from very loud subjective sounds. As she became convalescent, the parents noticed that the child could not walk without tottering, so that at first it was very doubtful whether this condition was to be simply referred to muscular weakness, or to

be regarded as the symptom of an affection of the labyrinth. But later, judging from the well-marked disturbance of hearing, we concluded that the labyrinthine affection had in some way affected locomotion.

To relieve the suppuration from the ear, we advised the boracic-acid treatment, and in order to produce resorption of the exudation in the labyrinth, we suggested hypodermatic injections of

R	Pilocarpin. muriat.	. . . . .	0.02
	Aquæ destillatæ	. . . . .	2.00
M.	Signa : Ten drops to be injected once daily.		

At a later date, I suggested that the injection should be used only every other day.

Nov. 30th.—Dr. Gernet writes to me : “The pilocarpin injections were given daily as you directed, and well borne. I have not as yet been able to discover that they have produced any effect. The child heard a woman’s voice in her left ear just *before* the first injection, but a man’s voice could not be heard. Since then, however, the hearing has increased quite perceptibly, and yesterday the child insisted that she could hear a watch tick. Total deafness still continues in the right ear. In the left ear, however, the discharge had ceased up to yesterday, but to-day it has reappeared, and with it we discover a notable decrease in the hearing. Otherwise the little patient is quite well. The abscesses in the neck have entirely healed, and the appetite is excellent. The gait is, to be sure, somewhat unsteady, but in my opinion it depends more upon her general weakness than upon vertigo or dizziness. The patient, moreover, makes no complaint whatever of the latter symptoms ; she thinks that she cannot hear so well with an ear-tube as without it.”

After some correspondence we agreed to continue the pilocarpin treatment, though in double strength.

Dec. 14th.—Dr. Gernet writes to me : “I am very glad to inform you that the patient is progressing so favorably that she now begins to hear also with her right ear, which in the beginning of treatment was totally deaf. The hearing of the left ear has improved decidedly, yet the deafness is still well marked. The treatment was continued as you directed, and the pilocarpin injections increased to double the amount daily, without any disagreeable symptoms manifesting themselves. Perspiration was well marked on the face only in the beginning of the treatment, but now nothing of the sort is noticed. There have been

no symptoms of collapse. The child has daily instruction, and understands what her teacher says. She cannot walk well yet, although so much improved in health and strength. Within a day or two she has first attempted to walk alone. She does not stumble, but spreads her feet and legs apart like a sailor and throws her body well forward when she walks. There is still some discharge from the right ear, but it generally disappears for two or three days after a single insufflation of pulverized boracic acid. Subjective sensations of sound do not appear to be perceived; if perceived, they must be weak. Shall we still continue the hypodermatic injections of pilocarpin?"

We now decided to continue this method of treatment, but not so frequently as before.

Dec. 26th.—I saw the patient again. She can repeat what is said to her without looking at the speaker's mouth, but she hears better with the left ear than with the right. By aërial conduction, she can hear the A tuning-fork, but not by bone-conduction at 1 m. She hears a table-bell and clapping with the hands. The suppuration in the right ear still continues, and is more abundant than in the left. The edge of the perforation in the right ear is granulated, while in the left ear it is not yet even cicatrized. We agreed to try a ten-per-cent. solution of lead acetate in the right ear, and a three-per-cent. solution of silver nitrate in the left ear.

Jan. 21, 1882.—Dr. Gernet wrote to me that the child had not heard conversation so well as before during one or two previous weeks, but that the condition was at present about the same as when I had last examined the patient. The tuning-fork was not heard quite so long by a few seconds in the right ear as in the left. The watch was not heard on contact or by bone-conduction in the right ear, while with the left ear it was heard at 2 to 3 cm. distance. These amounts, however, varied on successive days. She could distinctly hear with the worse ear the clapping of hands and ringing of a bell, the length of the chamber. The granulations had disappeared, as well as the discharge, so that all medication for the ear had been discontinued for about a week. Unless Dr. G. had been deceived by scales in the meatus, the perforation in the *Mt* had decidedly decreased in size. As relapses of deafness recurred, the pilocarpin injections were again resorted to daily, and then every other day, although without producing any decided improvement.

Feb. 22, 1882.—The condition of the patient is as follows : The discharge has ceased in both ears, and the perforations in the *Mt* are reduced to a minimum. Hearing in the right ear is absent. The A tuning-fork can be heard by bone-conduction in the left ear when open ; in the right ear only when closed. Low voice at 1 m., L. E.

Aug. 1883.—Dr. Gernet reports that the patient is capable of being educated, although rather a poor scholar. The parents think that the reason why the child makes so little progress is that she is lazy and does not try to study. The hearing, examined in a room 3½ m. long, gives the following results :

Whisper = 0 in both ears.

Moderately loud voice of a man is heard and understood at 3½ m. left ear, while with the right ear it is only heard as a noise.

With the left ear the child can distinguish a gentle clapping of the hands ; with the right, only a violent clapping.

The sound of the bell is heard at about the same distance with both ears.

Watch, left 10 cm., right, 5 cm.

Snapping with the finger-nails, left ear, 2 m. ; right ear, 1 m.

The tuning-fork, when struck loud enough to be heard for five seconds in the right ear, is heard in the left ear for ten seconds, and it does not appear to make much difference whether the fork is held on the calvarium or on the mastoid process.

Nov. 1, 1883.—I saw the patient once more, and was able to confirm the above statements, as well as the fact that both *Mt* had entirely cicatrized.

Politzer was the first aurist to recommend the use of hypodermatic injections of pilocarpin in fresh cases of syphilitic affections of the labyrinth.¹ Following his suggestion, I decided to employ the same remedy even when the case was not of a specific nature. Politzer injects from three to ten drops daily for ten or fifteen days of a solution containing pilocarpin, 0.04, aqua pura, 2.00. But as this was the first case in which I had used this powerful remedy, and as the patient was a child, I thought it best to be on the safe side, and consequently made the solution much

¹ *Compte rendu of the International Otological Congress, at Milan, 1880.* Compare, also, Politzer, "Ueber Ohrsyphilis," *Wien. med. Blätt.*, 1882, Nos. 30 and 31.

weaker. Perhaps a more concentrated preparation would have accomplished more good. Although it is apparently a fact that the hearing partially returned in the left ear on the morning *before* the first injection was made, yet the favorable action of the remedy upon the course of the aural affection cannot be denied. And even if the hearing which the patient regained was after all far less than normal, there can be no question that it is sufficient for an education, and enough to relieve the child permanently from the terrible condition of deaf-mutism. I likewise recommended the use of pilocarpin in a case of freshly acquired deaf-mutism after affections of the labyrinth in scarlet-fever, which I saw in consultation with Dr. Wolf, of Frankfort-on-the-Main, but unfortunately it was never used. It was used, however, with brilliant result in another case of total deafness after scarlet-fever.¹

¹ *Corresp.-Blatt f. Schweiz. Aerzte*, 1883.

ACQUIRED ATRESIA OF BOTH AUDITORY PASSAGES DUE TO CHRONIC ECZEMA.

BY PROF. S. MOOS, OF HEIDELBERG.

Translated by DR. J. A. SPALDING, Portland, Me.

L. G., unmarried, æt. thirty-three, of normal menstruation, has suffered for eight years with eczema of the head and of both auricles, as well as of both upper and lower extremities, the latter most extensively. Three years ago, as she supposed, from an extension of the eczema into the auditory passages, the ears began to discharge. After a long time the discharge ceased spontaneously, but from that time onward the hearing has been much reduced. H: low voice, R E 1 m., L E 2 m. Watch R E $\frac{3}{1000}$ L E $\frac{6}{1000}$. Tinnitus (roaring and hissing) is constant in both ears. Bone-conduction for the watch and tuning-fork is well preserved. Examination shows a funnel-shaped hole at the place usually occupied by the meatus in each ear, but the passage is entirely closed by a solid mass, so that a sound passed to the bottom of the cavity touches immediately upon hard bone.

It is probable that chronic periostitis of the osseous meatus was excited by the eczema at a time when the labyrinth was entirely unaffected. The patient did not put herself under treatment.

A PECULIAR MALFORMATION OF THE RIGHT EAR, WITH AN INTACT LABYRINTH.

BY PROF. S. MOOS, OF HEIDELBERG.

Translated by J. A. SPALDING, M.D. Portland, Me.

L. H. æt. twenty, consulted me April 20, 1882, for the following anomaly of his right ear.

The middle portion of the auricle is folded forward over the region of the tragus, entirely concealing the latter. At the same time the edge of this folded portion of the auricle is united with the soft parts of the ear and those in front of the tragus in such a manner as to cause furrows above and below the parts so united. The whole external ear is somewhat smaller than on the left side.

The right auricle measures $5\frac{1}{2}$ cm. high, the left $6\frac{1}{2}$ cm. ; the right auricle is 2 cm. wide, the left $3\frac{1}{2}$ cm. The right ear is deaf to speech, but a watch that ticks very faintly and all of my tuning-forks could be heard in his ear by bone-conduction. In spite of this I did not advise the patient to submit to an operation.

It is possible that the affected auricle was deformed by being caught in a loop of the umbilical cord.

The left ear was normal in form and function.

CARCINOMA OF THE CUTANEOUS-CARTILAGINOUS
PORTION OF THE MEATUS, WITH PERFORATION
OF THE AURICLE, EXTENSION OF THE GROWTH
TO THE LOWER PORTION OF THE MASTOID
PROCESS, AND PARALYSIS OF THE FACIAL
NERVE.

BY PROF. S. MOOS, OF HEIDELBERG.

Translated by J. A. SPALDING, M.D., Portland, Me.

Madame G., æt. fifty-four; November 9, 1877. She has been affected for six years with a discharge from the left ear, of which she has always been negligent. Since last June she has noticed a button-shaped swelling in the external meatus, which has gradually increased in size. She suffered from continuous burning pain in the tumor and had fever. In October, she first noticed paralysis of the same side of the face. Fourteen days before this, however, a tumor as large as a walnut had made its appearance behind the left auricle, and as it was regarded as an abscess of the mastoid process by the physician in attendance, he made a long incision throughout its entire extent.

I found the entrance of the meatus occluded by a tumor as large as a walnut, starting from the lower wall of the meatus, bleeding easily, and entirely hindering any deeper inspection of the parts. Behind it and in its base as it were, was a hole, involving chiefly the auricle, while extending backward and occupying about the entire lower third of the mastoid process, was a knobby tumor the size of a nut, offensive to the smell, covered with pus, and lying in direct connection with the tumor in the meatus.

The left half of the face was paralyzed; water injected into the defects in the auricle escaped through the Eustachian tube, showing that the *Mt* also was perforated. With the exception of

a discharge from the ear no assignable cause for the carcinoma could be discovered.

The disease had probably crept along the lymphatics from the external meatus, through the auricle, and then behind the ear. From thence it had made its way to the facial nerve, just before its escape from the stylo-mastoid foramen, and destroyed it.

TWO CASES OF CONDYLOMATA, AND ONE CASE OF PRIMARY SYPHILIS OF THE EX- TERNAL EAR.

BY DR. J. ZUCKER, OF BERLIN.

Translated by Dr. J. A. SPALDING, Portland, Maine.

VERY little has been published concerning the rare occurrence of syphilis upon the external ear or within the meatus, since the appearance of Stöhr's excellent paper.¹ For, wide as is the diversity of opinion concerning the frequency of this disease in the middle or inner ear,² almost all otologists agree in asserting the extreme rarity of syphilis upon the external ear.

If we examine the text-books of otology, we find that Politzer³ and Urbantschitsch⁴ make mention only of squamous, pustular, and papular exanthemata on the auricle, while the former refers to an observation by Burnett, of the appearance of specific nodules in the same locality. Politzer particularly speaks more in detail of condylomata in the auditory meatus, but remarks that they differ only in locality from those which are seen in other regions of the body, and rarely demand an extremely energetic treatment. Ulcers, with a whitish base and steep edges, are much more rarely observed in the meatus, and never, except in connection with syphilitic affections, of the

¹ *Archiv f. Ohrenheilkunde*, Band v.

² Roosa : these ARCHIVES, vol. viii., p. 336 ; and Sexton : *Transactions of the American Otolog. Soc.*, 1878.

³ "Lehrbuch," p. 691.

⁴ "Lehrbuch," p. 137.

middle ear. V. Troeltsch¹ mentions syphilis as a cause of otitis externa, and reminds us that condylomata, when cicatrizing, often produce circular contraction of the meatus. Moos² describes the differential diagnosis between the rod-shaped and overlapping proliferations of the condylomata, and polypi in the meatus which sometimes look like them. Hartmann³ has never seen any thing but condylomata in the external meatus; while Schwartze,⁴ in his excellent paper on syphilis of the ear, insists especially upon the appearance of ring-shaped ulcers with a dirty-white coating connected with excessive swelling of the lymphatic glands in the neighborhood of the ear. Wilde⁵ reports a case in which the external meatus was entirely occluded by a number of condylomata, whilst Field⁶ describes a similar one in which two thirds of the auricle were destroyed by ulceration, although it is impossible to tell from his description ("I diagnosed a syphilitic taint") whether the ulcer was a manifestation of primary or secondary syphilis. The most accurate valuation of the clinical symptoms, as well as of the treatment of condylomata of the auditory meatus, is to be found in Stöhr's paper already mentioned,⁷ and it is a fact well worth noticing, that, in the relatively short space of three years, this author was fortunate in meeting with fourteen cases, while all other authors have observed but few cases. Thus, for example, Buck⁸ has only seen in three quarters of one per cent. of all of his cases syphilitic diseases of the ear, and only five cases of syphilitic affections of the external ear, in four thousand patients. In two of these, there were syphilitic ulcerations of the auricle; in the third, the ulceration was discovered in the meatus; whilst in the two remaining cases, the meatus was entirely filled with syphilitic

¹ "Lehrbuch," 7th edition, pp. 116, 123, 132.

² *Klinik. der Ohrenheilk.*, p. 287.

³ "Lehrbuch," 1st edition, p. 79.

⁴ *Archiv f. Ohrenheilk.*, Band iv., p. 254.

⁵ "Practical Observations," etc., (American edition,) 1853, p. 202; quoted in these ARCHIVES, viii., p. 165.

⁶ *British Med. Jour.*, Oct. 6, 1877.

⁷ *Archiv f. Ohrenheilk.*, Band v., pp. 130-137.

⁸ *American Journal of Otology*, 1879. p. 25.

granulations. Knapp¹ has seen syphilis of the auditory meatus but once in about ten thousand patients. On the contrary, Ravogli,² who examined one hundred and forty-four syphilitic patients, fifteen of whom had an affection of the middle ear (seventy-seven had suffered from numerous condylomata on other parts of the body), *never* saw a condyloma in the auditory meatus, and only once a nodular and hard eruption on the auricle and within the meatus, the origin of which he was inclined to attribute to syphilis in the nurse of the patient. Despres³ examined twelve hundred syphilitic patients, and saw once—*an unique case*—a soft chancre, and five times broad condylomata in the meatus; and, besides these, “quite a number” on the auricle and in the hole which had been pierced for the ear-ring. Köbner⁴ has also observed a single case of round papules, associated with condylomata in the opposite meatus, extending inward about half an inch from the auditory orifice.

I have carefully examined the journals of Dr. Hartmann's clinic for the last two years, during which period more than two thousand aural patients were treated, and I have discovered but one case of the formation of condylomata in the meatus. This case is as follows :

C. F., a mason, æt. twenty-seven, was first seen January 6, 1882. The patient became infected with syphilis two years before. The right ear had discharged previously, and had for a long time been deprived of hearing ; the left ear was first attacked in the spring of 1881 with pain, followed by a discharge which, however, ceased in a month. Five weeks ago the patient had first perceived a feeling of fulness in his right ear, and had been obliged to use a hairpin “to make the air go into his ear.” Within a fortnight, pain and moderate secretion had again been noticed in this ear. The examination showed that both auditory passages were completely closed by swelling, the orifices surrounded with ulcerated tumors, which were separated from one another by deep

¹ These ARCHIVES, vol. viii., p. 165.

² *Compte rendu du Congr. Internat. d'Otol.* Milan, p. 129.

³ *Annales des maladies de l'oreille et du larynx*, December, 1878.

⁴ “Klinische Mittheilungen aus der Dermatologie und Syphilidologie,” *Erlangen*, 1878, p. 53.

furrows. The treatment consisted in repeated cauterization with silver nitrate in substance, after which the tumors rapidly diminished in size. The patient also submitted to a course of inunction, while later red precipitate salve was applied to the parts.

Feb. 9th.—The process has come to a stand-still.

March 3d.—The swelling can no longer be discovered, and the orifices of the auditory passages appear normal. The hearing in the left ear, although a perforation-whistle had been quite audible only a week before, is almost normal. Watch $\frac{95}{100}$ cm. Whispered voice, seven paces.

The second case was apparently one of infection with a soft chancre, but as the patient was soon lost to sight, we could not of course state whether any other symptoms of general syphilitic infection ensued at a later date. Yet the condition in the ear bore great resemblance to the typical broad condyloma.

This patient appeared for treatment December 12, 1878. Ten weeks previously he had acquired a soft chancre which had been cured in six weeks. Fourteen days before the specific ulcer healed, he was attacked with pain in the right ear, which was followed by a discharge, both of which continued permanently up to the time of his first visit. Examination shows that the orifice of the external meatus of the right ear is entirely surrounded with a granular mass which bleeds even when but slightly touched. Many furrows are visible between the individual granulations. *We abstained from constitutional treatment*, and simply touched the whole mass with silver nitrate in substance, whereupon the swelling rapidly diminished and the pain ceased. Several cauterizations effected a perfect cure.

We have now seen that all of the cases hitherto reported have simply exhibited various forms of syphilis in the later stages of the disease, and that they corresponded generally to the stage of constitutional infection. I have never yet discovered, in all accessible otological literature, a single case of primary syphilis of the external ear. And even Mracek,¹ in his exhaustive report of over four hundred cases of the primary manifestation of syphilis outside of the genital tract, cites but three cases of primary syphilis of the external ear: one, reported by Hulot,² of a child with a chancre

¹ "Die syphilitische Primärsclerose ausserhalb der Genitalsphäre." *Wiener med. Presse*, 1880, No. 1.

² *Annales de dermatologie et de syphilogr.*, 1878.

on the mastoid process, which was attributed to infection by the nurse; a second of a chancre on the base of the tragus, the origin of which was problematical; and finally a case from his own practice, and related in profuse detail, of a chancre on the lower portion of the mastoid process, which appeared to have originated from the kiss of a prostitute. Pellizzari¹ also examined with great care forty-one cases of the transmission of syphilis without coitus, and found only one (*l. c.*, p. 58) in which the primary effect of this disease appeared in the form of one chancroid on the left cheek and a second on the lobe of the auricle of the same side. The origin of the chancre is not referred to the sleeping of father and son in the same bed, but to the mutual use of a handkerchief which the son had previously employed in washing his penis.

I have lately seen a case similar to the one reported by Mracek.

July, 1883.—Mr. X. consulted me for a painful swelling on his right ear, which had steadily increased in size despite a variety of treatment. Closer examination shows that the anterior wall of the cartilaginous meatus is bulging excessively inward and backward, the tragus of a livid red, twice as thick as the normal, while its anterior surface is covered with a darkly pigmented radiating cicatrix. The entire parotid region appears to have become involved in the process, for it is extensively swollen, and feels as hard as a board. Still it is not at all painful. Beneath the angle of the inferior maxillary bone we discover a bunch of separable yet indurated and enlarged lymphatic glands. The patient's hearing is but slightly diminished in acuteness. There is no secretion from the ear. The posterior wall of the cartilaginous and osseous meatus, as well as the *Mt* (easily visible) are normal. The recent appearance, on the surface of each hand, of three or four small, round, slightly scaly efflorescences facilitated the diagnosis of a primary syphilitic infection. On the rest of the body we could discover nothing except moderate swelling of the lymphatics of the neck and axilla. The inguinal glands were not swollen. The naso-pharynx was free from complications; the genitals intact. After some denials, the patient confessed

¹ "Della trasmissione accidentale della sifilide." Mailand, 1882.

that he had had intercourse ten weeks before, and that the woman in the excess of her fervor had kissed him in the most passionate manner "all over his ears." He was unable to state whether his ear had in any way been previously abraded. Four weeks later, while shaving, he noticed near the tragus an excoriation which, despite repeated use of ointments, gradually and steadily increased in size, began to suppurate, and caused him a great deal of mental irritation on account of the disfigurement which it produced. The eruption on the hands made its first appearance eight days before I saw him, that is to say, about eight weeks after the infection. A course of inunction produced a perfect and rapid cure.

THE RESULTS OF THE EXAMINATION OF FOUR PETROUS BONES OF TWO DEAF-MUTES.*

BY S. MOOS AND H. STEINBRÜGGE, OF HEIDELBERG.

(*With three figures on Plate I.*)

Translated by WM. RANKIN, JR., M.D., Newark.

FIRST DEAF-MUTE, (KARNATZ.)

AGE : End of the fiftieth year. It is uncertain whether he suffered from a congenital or an acquired deaf-mutism. Death from pulmonary and peritoneal tuberculosis. Chronic lepto-meningitis of the convexity.

Larynx : Anterior part of the thyroid and cricoid cartilages ossified. On the right true vocal cord a brownish-black, bloody, infiltrated spot. (Ulceration?)

Inspissated cerumen in both auditory canals.

Nasal cavity : Normal, except a slight bending of the septum toward the right, and a spine on the right side of it. The mucous membrane on the posterior wall of the pharynx somewhat hyperæmic.

Mouths of the tubes : Hook-shaped fold, posterior lip and fold, Rosenmüller's fossa, well developed. The latter and the mouths of the tubes contain some mucus. The right cartilaginous tube appears normal upon dissection.

Right external and middle ear.

Right membrana tympani perforated to a great extent posteriorly (wearing through of the plug of cerumen?).

* We are indebted to Dr. E. Fränkel, Pathologist, of Hamburg, for the petrous bones, as well as the notes of the histories and autopsies.

The remainder firmly drawn in; bound by fine adhesions to the promontory. Adhesions in the neighborhood of the tendon of the tensor and the stapes. Roof of the tympanic cavity very thick, mucous membrane of the tympanic cavity somewhat opaque, not thickened. Ossicles well formed, movable. The vertical diameter of the tympanic cavity shortened by a bladder-shaped enlargement of the fossa jugularis projecting from above. By its highest point, which is transparent, the entrance to the round window is transformed to a fissure. The longitudinal diameter of the fossa jugularis measures 12 mm., the transverse diameter 9 mm. Osseous tube and tympanic mouth of the tube narrow, but otherwise normal.

Left external and middle ear.

Roof of the tympanic cavity likewise very thick. Membrana tympani perforated in the anterior half. Tympanic cavity filled with a mucous exudation composed of granular cells, free fat, and amorphous black pigment. Mucous membrane of the tympanic cavity thickened, especially over the promontory, and traversed by a thick network of vessels. The vessels examined microscopically appear enlarged and bulb-shaped. Adhesions in the niche of the round window. Ossicles well formed. On this side, the floor of the tympanic cavity is also thin, and stands remarkably high, so that in a vertical incision through the promontory, the floor of the scala tympani of the first cochlear convolution comes in a line with the floor of the tympanic cavity. Symphysis of the stapes with the vestibule normal. The microscopical examination of a membrana tympani (right) yields negative results, whereas both tensor tympani contain only few muscular fibres, those present, however, appearing normal. Between them are abundant connective tissue and very numerous large fat globules, which contain, besides pigment, bunches of margarin. In the niche of the round window, adhesions and purulent secretion.

Result of the microscopical examination of the right labyrinth.¹

Both nerves in the internal auditory canal normal. In

¹ All four petrous bones were treated seventy-two hours in a one per-cent. solution of osmic acid, and decalcified according to the method previously described.

the neurilemma of the acusticus, isolated black-colored globules, probably fat colored by osmium.

On the further examination of sections taken from various parts, the bony structure of the entire labyrinth appeared normal. The chief nerve tracts proceeding to the separate structures of the labyrinth also appear normal, whereas the nerves are deficient in the first and second convolutions of the cochlea from Rosenthal's canal and also a large part of the ganglion cells in Rosenthal's canal itself (see plate, figs. 1 and 2, for the similar condition on the left side), while from the centre to this place, the entrance of nerve fibres could be demonstrated (see fig. 2 for the other side).

The labyrinth was very vascular in every part. Numerous connective-tissue adhesions appeared in the scala tympani of the second and third convolutions. Everywhere the organ of Corti and the membrana tectoria were wanting, while Reissner's membrane was preserved but collapsed.

We found peculiar bodies in the utriculus, the same in epithelium of the nerves, also on the posterior wall and also on the inner surface of the horizontal and sagittal ampulæ, likewise in the well-preserved ligamentum spirale of the second and third convolutions of the cochlea. These bodies had partly a round, partly a pear and club-shaped appearance, were either of double contour or in concentric layers. The test with malachite green as well as the iodine-sulphuric acid reaction gave a negative result, so that unless the long continued treatment of the preparation with chromic acid prevented the amyloid reaction, it is probable that we had here the extensive occurrence of colloid or hyaline bodies.

Results of the microscopical examination of the left labyrinth.

Trunk of the acoustic and facial nerves in the inner auditory canal normal.¹ In the cochlea, as on the right side, the nerve-fibres within the lamina spiralis ossea of the entire convolutions to the ganglion layer in Rosenthal's canal are wanting (see *l. o.* fig. 1). In the central part of the ganglion zone appears a defect caused by atrophy of the

¹ On the posterior upper wall of the tympanic cavity a defect of the fallopian canal was visible where the nerve with a part of its superficies freely projected.

ganglions (see *c. R.* fig. 2). On the periphery of this defect, ganglion cells were found only scantily and for the most part wasted, only slightly granulated but containing distinct nuclei. Examined by a low power the interior of the scala appears for the most part filled with a granular appearing mass, which under a higher power seemed to be composed of large and small, round, strongly granulated ganglions and cells and scanty otoliths (see fig. 1). The whole mass is held in *situ* by coagulated lymph.

Huschke's teeth, the cords of the zona pectinata as well as the vas spirale were still present unaltered; Corti's and Reissner's membranes were also unaltered, but still visible only in isolated parts of the convolutions and Corti's membrane was somewhat thickened in parts.

Of Corti's organ (see fig. 3) a large part of the cellular elements, their protoplasma as well as their nuclei, were of a deep black color (broken-down fatty products colored black by osmium). The arches of Corti are not visible; the whole structure consists of an aggregate of variously formed cells on which only a few supporting cells are still clearly to be seen (see fig. 3, left and outward).

The epithelium of the nerve is entirely wanting in the sacculus, as also the afferent nerves; it is preserved on both in the utriculus. On its anterior wall, as in the right utriculus, are numerous colloid bodies of a yellowish green appearance (effect of the chromic acid). In the ampullæ are many black colored granules and clusters of granular cells, products of the fat metamorphosis, colored by osmium.

SECOND DEAF-MUTE, THIRTY YEARS OLD.

On the preparation, which was removed according to Schalle's method, irregularities in the structure of the cranial and facial bones appear, inasmuch as the petrous bones are small, delicately formed, and slender, while the bony palate is hyperostotic. The nasal septum is prominent through a bending toward the right, whereby a concavity arises in the left nostril. The ledge-like prominence runs horizontal on the convexity of the bend of the septum, and touches the inferior turbinated bone. In the right maxillary sinus, a cyst with honey-like contents.

In the pharyngeal space the mouths of both tubes are narrow, as, for instance, the right measures in the vertical diameter 7 mm.; in the horizontal diameter, only 3 mm.

Right petrous bone.

Interior of the cartilaginous tube narrow. Membrana tympani drawn in, hyperæmic, with diffuse calcareous infiltrations; short process visible; handle of the malleus not. Mastoid process small and sclerosed. Ossicles very delicate, of normal formation, and movable. Adhesions stretch from the head of the malleus, as well as from the neck, to the point of insertion of the short process of the incus. Osseous tube and its tympanic mouth narrow. Processus cochleariformis strongly developed. Digital impressions very deep, and separated from the carotid only by a very thin plate of bone. Near this point the carotid lies exposed, and is enlarged in its diameter to 6 mm., while the canal at its entrance and exit measures only 4 mm. Fossa jugularis in the longitudinal diameter 12 mm.; in the transverse diameter, 11 mm. In the inner auditory canal nothing abnormal.

Left petrous bone.

The fossa for the Gasserian ganglion is certainly deep, but a dehiscence is not present, as on the other side. Mastoid process small and sclerosed; roof of the tympanic cavity tolerably thick. Ossicles as in the right, but covered by a thickened mucous membrane. Pseudo-ligaments round about the tendon of the tensor and the crus of the stapes. Mucous membrane of the membrana tympani is opaque. Nothing peculiar about the tube. Fossa jugularis smaller than the right, especially in the transverse diameter.

Microscopical examination of the structures of the middle ear.

The tensors of both membrana tympani contain only a few muscular fibres. They are composed principally of connective tissue and fat. The left tube shows partial calcification and transformation of the hyaline cartilage into fibro-cartilage. One sees groups of cartilage cells with irregular angular nuclei which remind one of bone corpuscles, and fibres proceeding from these cell groups like the spokes of a

wheel interlace and cross with the fibres of neighboring cell territories. Levator veli strongly developed. Only a few fibres of the tensor veli could be discovered (perhaps in consequence of awkward preparation on our part). Toward the ostium pharyngeum the cartilaginous hook appears very small and recedes in transverse sections, while the median cartilage is broad and strongly developed, and is moreover in a lateral direction even on the floor of the canal more strongly bent over than on the upper, as is not unfrequently observed.

Microscopical examination of the left labyrinth.

Cochlea: Immediately behind the round window in the scala tympani are found bony adhesions of the lamina spiralis ossea, with the wall of the scala lying opposite, while the membrane of the round window is itself preserved intact. Further upward in the scala tympani of the first convolution are found only connective-tissue adhesions; further, in the ductus cochlearis heaps of round nuclei and cells, for the most part colored black (cheesy masses colored by osmium) and held together by coagulated lymph. In the entire first cochlear convolution the nerves within the lamina spiralis ossea are wanting, while the ganglions in Rosenthal's canal are partly present. Further upward the adhesions of the scala tympani decrease, the scala vestibuli becomes smaller and appears compressed from before backward. The nerves lying between the centre and Rosenthal's canal are preserved.

In the second convolution some nerve fibres are visible inside the lamina spiralis ossea, and the ganglion cells in Rosenthal's canal are present in greater numbers.

Reissner's membrane exhibits for the most part many curves. The basilar membrane is everywhere broken, the membrane of Corti is preserved here and there.

In the sacculus, similar conglomerations of cells as in the ductus cochlearis. Utriculus united by connective-tissue adhesions to the base of the stapes, its ligaments of attachment thickened by connective-tissue neoplasm. The nerve epithelium of the macula absent; in its place are found globular and club-shaped hyaline bodies. On some of the

preparations these bodies do not lie free upon the macula but are covered by a thin investing membrane, and moreover, appear isolated and encapsulated by partition walls. These bodies are found on other points of the walls of the utriculus, also between the hypertrophied ligaments of attachment. The nerves of the utriculus itself are preserved.

In the frontal ampulla is found a portion of the cupula terminalis which is also present in the horizontal ampulla.

Right labyrinth.

In the preparation, the acoustic and facial nerves had been already removed from the internal auditory canal. In the niche of the round window numerous adhesions, its membrane bent convexedly toward the tympanic cavity. In the mucous membrane of the niche of the round window, clusters of cells with large nuclei, extending almost to the periphery.

Vestibule very small. In the epithelium of the utriculus the same hyaline bodies as in the right. In one of the semicircular canals, greenish colored round bodies (inorganic). The same are also found in the horizontal and frontal ampullæ.

The condition in the right cochlea conforms entirely with that in the left cochlea, with the exception of the osseous and connective-tissue neoplasms in the first part of the first convolution. For that reason we abstain from a detailed description.

Critical remarks on the conditions in all four petrous bones.

The following conditions of the labyrinth are common to all :

1. The absence of the nerves in the lamina spiralis ossea in all first cochlear convolutions (yet some nerve fibres remain in the superior convolutions in both petrous bones of the second case, as were described).
2. The stuntedness and atrophy of the ganglion cells within Rosenthal's canals.
3. The imperfect development and fatty degeneration of the organs of Corti.

4. The filling up of the ductus cochlearis in the one case, and the scala vestibuli in the other case, with cheesy masses which were intimately combined with coagulated lymph.

5. The occurrence of hyaline masses in different points of the membranous labyrinth.

As special conditions may be mentioned, the connective tissue and osseous adhesions in the scala tympani of the first part of the first cochlear convolution in the left labyrinth of the second case, and the absence of the nerve epithelium and the nerves in the left sacculus in the first case. These conditions, as also the presence of thickened cheesy masses in the scala and the hyperplastic condition of the ligaments of attachment of the utriculus, are certainly to be regarded as the sequelæ of an early inflammation in the entire labyrinth; and the hyaline bodies as products of degeneration of the cellular structures previously destroyed by inflammatory processes. But whether this early disturbance began during intra-uterine life or a short time after birth must remain undecided. Both views can be sustained by some of the conditions described. In support of an intra-uterine disturbance speaks the peculiar condition of the organs of Corti in the first deaf-mute (see fig. 3), which, with regard to its configuration as to the condition of its cellular structures, makes an arrest of development in an earlier stage, seem probable (great resemblance to the so-called small epithelial eminence), while in all other respects in both cases the normal development of the separate regions of the labyrinth and the structures favor the assumption of its origin shortly after birth.

Also in regard to the atrophy of the nerves in the cochlea and the atrophy of the ganglion cells in Rosenthal's canal there may be different opinions as to whether the conditions are to be considered the sequelæ of an inflammatory action or an atrophy from inactivity continuing for ten years. At all events it is very remarkable that the nerve-trunks and their branches up to Rosenthal's canal had not taken part in the atrophy. This condition speaks for the already recognized fact, that a nerve as long as it is in con-

section with its central part will not suffer from a total atrophy, providing that no pathological changes from other causes have taken place in the centre itself.

As regards the utilization of these anatomical conditions for the functional examination of deaf-mutes, it would in our cases probably have led to the result that they heard either none at all or at least very few musical tones.

Explanation of the Figures.

FIG. 1.—The half of a section through the first cochlear convolution, left (from Karnatz) Hartnack $\frac{3}{4}$. In the clear space between the layers of the lamina spiralis ossea (*l. o.*) the nerve is wanting. The greater part of the scala vestibuli is (by a low magnifying power) filled with a granular appearing mass, which under a higher power appears composed of small and large, round, strongly granulated nuclei and cells. The whole mass is held together by coagulated lymph, in which here and there enclosed otoliths appear. The ligamentum spirale terminates at *l. sp.*, projecting also remarkably far inwardly.

FIG. 2.—A section through the entire first cochlear convolution, left (from Karnatz) Hartnack $\frac{3}{4}$. At *n* one sees the cut off end of the acoustic nerve passing off in a central direction; at *c R* a defect caused by atrophy of the ganglion layer in Rosenthal's canal. Toward the canal of the lamina spiralis ossea and in it the nerves are again wanting. The ligamentum spirale as in fig. 1. On the wall of both scalæ a thin border of coagulated lymph.

FIG. 3.—A vertical section through the organ of Corti of the first cochlear convolution of the left side of the same deaf-mute. Hartnack $\frac{3}{4}$ imm. In a great part of the cellular elements both the protoplasm and the nuclei have a deep black appearance (in consequence of the influence of the osmic acid on broken-down fatty products). The arches of Corti are not visible, the whole structure consists only of an aggregate of variously formed cells upon which toward the outer part (left) some supporting cells are still clearly to be recognized.

ON THE COMPARATIVE DIAGNOSTIC VALUE
OF AËRIAL AND BONE-CONDUCTION, AND
OF QUANTITATIVE VARIATIONS IN THE
PERCEPTION OF HIGH AND LOW TONES.

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WE are still looking about us in vain for a moderately accurate differential diagnosis between the so-called sclerosis of the middle ear and nervous deafness,¹ or, in other words, for some means for satisfactorily determining the extent to which the sound-conducting and sound-perceiving apparatus are affected in various cases. For this reason I need not offer any especial excuse for publishing in these ARCHIVES my personal experience in this direction, or for offering various critical remarks upon the present state of these important questions to which Lucaë, Dennert, and Jacobson have of late drawn the attention of the profession.

At the same time, however, I would remark that on the whole I shall keep in mind only such cases as those in which, as is usual in sclerosis of the middle ear, the affection is bilateral, for in unilateral diseases the impossibility of eliminating the hearing of the healthy ear seriously interferes with the accuracy of all tests with the T.-F.,² nor will

¹ Lucaë makes use of this term because it is at present so difficult or almost impossible to diagnosticate labyrinthine deafness from that which is due to an affection of the auditory nerves or of their cerebral centres.

² T.-F. in the following pages stands for tuning-fork; A.-C., for air-conduction; B.-C., for bone-conduction.

I especially discuss the value of Weber's experiment,¹ *i. e.*, unilateral intensification of B.-C.

I.

I have for several years tested the relation of B.-C. to A.-C. somewhat after the fashion of Rinne's experiment, by applying large tuning-forks furnished with clamps directly to the mastoid process and then holding them just opposite the orifice of the meatus, without, however, allowing them to touch the auricle. This method has proved of practical diagnostic value in my hands, and to it I attribute quite as much, if not more, importance than to quantitative variations, in the perception of high and low tones.

Unfortunately, we are not yet able to explain what actually happens in B.-C., and from this fact arises the extreme variety of opinion concerning its diagnostic value. But even if we cannot at this moment explain precisely how the molecular vibrations advance along the bones and excite the auditory nerve, *clinical experience compels us to assume that other causes come into play in B.-C. than in A.-C.; that B.-C. is entirely different from A.-C.; and, finally, that in the process of B.-C. the waves of sound which are given off from the bones of the cranium to the air in the auditory meatus and conducted in the usual way through the Mt (by vibrations as a whole) do not play (as Helmholtz has asserted) the chief rôle.* If this be not as I assert, how, then, can we explain (leaving aside those pure cases of synostosis of the stapes, of which, however, so far as concerns the subject now lying before us, very few accurate observations have yet been made)—how, then, I say, can we otherwise explain those numerous cases in which, with bilateral immovable fixation (or dislocation) of the handle of the hammer or of the other ossicles, the tuning-fork cannot be heard by A.-C., even when held as close as possible to the orifice of the meatus without touching, while, on the contrary, the same fork can be distinctly heard by B.-C.? To say nothing of the fact that under these circumstances we cannot speak of vibrations as

¹ Although Politzer ("Lehrbuch," p. 785) lays greater stress upon this experiment than upon Rinne's, I regret to say that I cannot agree with his opinion.

a whole,¹ it would also be difficult for us to comprehend how a fractional part of the vibrations, which in B.-C. are given off to the air of the meatus and to the *Mt*, could excite the auditory nerve into functional activity, while the vibrating T.-F., held directly in front of the orifice of the meatus, but without touching the auricle, could not accomplish the same, despite the larger number of vibrations.

The following observation by Wolfe² also proves that in B.-C. the auditory nerve is not excited in the usual way by vibrations of the *Mt* and of the ossicles as a whole.

In a case of complete unilateral obstruction of the Eustachian tube by a musket-ball, with excessive concavity of the *Mt*, *the forks middle c and a' were faintly heard, but heard a fifth higher by A.-C. when held directly in front of the orifice of the meatus, while by B.-C. their tones were heard much more distinctly but not raised in pitch at all.* Wolfe explains the elevation in pitch by increased tension of the *Mt*, for, according to his experiments,³ tones passing through a membrane undergo an elevation in pitch when the tension of the membrane is increased.

Lucæ also⁴ long ago described the post-mortem condition in a very interesting case of unilateral malformation of the ear, in which, upon the affected side, there was neither external nor middle ear, neither round nor oval window, while in the labyrinth the cochlea and semicircular canals as a whole were completely developed and normal; the scala tympani ended blind in solid bone. Now it was notorious that this patient could not hear a bell (*a'*) or a T.-F. in the malformed ear unless either the one or the other absolutely grazed the side of the skull, while by B.-C. both the bell and various forks could be heard distinctly though not quite so loud as in the other (normal) ear.

It is unfortunate with so interesting a case as this before us, that we feel obliged to remark, that in these experi-

¹ If we coincide with Voltolini and rely upon the assistance of the round window, and assign an opposite direction to the waves of sound, this would, as Politzer has already shown, presuppose an exit at the oval window, without which it would be impossible to believe in the vibration of the labyrinthine fluid as a whole.

² These ARCHIVES, vol. ii., part 2, p. 61.

³ "Sprache und Ohr," page 196, and these ARCHIVES, vol. ii., part 2, page 67.

⁴ *Virchow's Archiv*, Band xxix., page 62.

ments with B.-C., the associated action of the healthy ear could not be accurately nor totally excluded.

I agree with Lucæ in attributing the intensification of bone-conduction in diseases of the external and middle ear to the pathological resonance in the ear rather than to an obstruction to the escape of the vibrations. And to the reasons which he proposes in opposition to the latter theory¹ I would add still others based upon my own clinical experience: (1) That in those cases in which B.-C. is pathologically intensified, we generally notice that the tone is altered and has a metallic tint. If, for example, I fill my ear with water and tap with my fingers against the bones of the head, the tone sounds metallic, and as if I had struck a tightly stretched drumhead. (2) I have found in pure sclerosis of the middle ear, and despite an extreme degree of obstruction to the usual conduction of sound as well as to its escape, that the intensification of B.-C. is less marked than in most of the other affections of the external and middle ear, and still less marked than in acute inflammations of these parts, or in cases of polypi, plugs of cerumen, collections of exudation in the meatus or in the tympanum, etc.; and yet the explanation of this fact is easy, for in all of these last-mentioned diseases or cases, the opportunities for resonance are much more favorable than in any given case of simple sclerosis of the middle ear.

Our ears were calculated for ærial waves of sound, and for this variety of transmission, resonance is, so far as possible, entirely eliminated. But the conditions of resonance would be of quite a different sort, if, as happens in B.-C., the bony walls of the middle ear and of the meatus vibrated also. Unfortunately we live at present in a state of profound ignorance on all these points, nor do we know any thing definite concerning the part, if any, which the Eustachian tube plays in the physiological resonance of the human ear. At the Otological Congress in London² Fourier defended the theory that the function of the Eustachian tube was to convert the closed tympanum into an open

¹ "Die Schalleitung durch die Kopfknochen," 1870; also *Archiv f. Ohrenhklde*, Band xix., page 73.

² *Archiv f. Ohrenhklde*, Band xix., page 76.

cavity, *in order to reduce to a minimum a resonance which could not be reconciled with normal hearing.* Physiologically the tube is only temporarily closed during the act of swallowing, when speaking certain tones, or during the act of singing. Lucaë also long since asserted that the waves of sound escape through the tube into the pharynx. Yet, in opposition to such a view, we may here call attention to the experiments of Mach and Kessel, which prove (to say nothing of autophony observed when the tube is open) that a simultaneous conduction of the waves of sound from the tube and from the auditory meatus would greatly weaken the usefulness of the *Mt.* The future alone can tell how far these dissimilar views can become reconciled, but we already know that the Eustachian tube opens like a valve much more easily from the tympanum to the pharynx than inversely (Hartmann). Observations upon myself and others incline me to side with those who fear that complete closure of the tympanum would produce a disturbing resonance—disturbing to B.C. at least,—and I do not think that the essence of the whole affair has been by any means sufficiently defined by asserting that the tube is generally closed. Thus, I was lately able to make the self-observation that, while walking out one day at a time when I was affected with a nasal catarrh, with a moderate degree of swelling of the right tube, the rolling of the horse-cars, even when at a distance, produced in my ear an unusual, dull noise, much louder than ordinary. As my aërial conduction and hearing distance did not appear in any way impaired, it was plain that the vibrations conducted directly to my body along the (then frozen) ground, had, in connection with an occluded Eustachian tube, produced an unwonted resonance in one ear. I could not doubt that the tube was partly occluded, because there were no foreign substances in the meatus, while on the contrary I felt in the tube a sense of fulness, and at the same time the results of the air douche were unsatisfactory, and Valsalva's experiment was imperfectly performed. I will add, moreover, that after careful use of an appropriate gargle and the insufflation of a one third of one-per-cent. zinc solution through

the catheter into the tube, the train of symptoms just mentioned disappeared in a day or two. I will additionally remark that at times when I perceive the occluded and sticky sensation in the ear, the mere act of touching the temple or auricle of the affected side produces a different and a more resonating tone than that upon the healthy side, and that at that time I likewise hear a deep humming noise, which is evidently a muscular or circulatory noise, rendered audible by resonance.

Considering the great importance of Hensen's "Physiology of Hearing" for practical physicians, I should like at this place to offer a few remarks on the manner in which he represents cranio-tympanal conduction with which I regret to say I cannot quite agree. Hensen, as is well known, supports Helmholtz's assertion that even in B.-C. the usual method of the conduction of sound still plays the chief rôle. To this I must say that we have no right to find fault with the physiologist when he strives with all his might against the opinion that the terminal apparatus of the auditory nerve is excited not only by vibrations of the *Mt* and ossicles as a whole, but additionally by the molecular vibrations of the fluid within the labyrinth. Nevertheless, clinical observations speak plainly enough, and when Hensen asserts that "we have not yet discovered how far a direct B.-C. produces a sensation of hearing," he must be referring simply to the precise method in which B.-C. takes place, for the fact itself is acknowledged universally by all eminent otologists. And when he further says that "many observers in years gone by endeavored to explain the peculiar fact that the tuning-fork is so well heard through the bones of the head, by assuming a direct conduction of the sound from the bones to the labyrinth—but such an opinion as this cannot be maintained." And again, when he refers to this same point, and endeavors to call to his aid not only Rinne and Lucæ, but Politzer himself,¹ "who" as he says "has distinctly demonstrated that the tone does not pass directly from the cranial bones to the petrous bone, but in a roundabout manner through the *Mt*, the ossicles, and the oval window," the reader might think that Politzer denied the possibility of B.-C. This, however, is not at all so, for in the very paper just quoted, as well as in his "Handbook of Otology," Politzer expresses himself quite unreservedly and un-

¹ *Archiv f. Ohrenheilkde*, Band i., page 318; a paper which, we may remark, though written twenty years ago, is still worthy of careful perusal.

equivocally in favor of a direct B.-C. Thus, for instance, in the paper which Hensen quotes, Politzer, after speaking of aerial conduction, continues (page 320): "But bone-conduction transmits to the labyrinth those waves of sound which originate from the movement of various molecules against one another (direct conduction to the labyrinth), as well as from the vibrations of whole masses (*Mt* and ossicles of the ear). It is in this way that we are to look at the view expressed by Bonafont, that the waves of sound reach the labyrinth in a decidedly modified form, depending upon whether they have been conducted to that part of the organ of hearing by the *Mt* and ossicles, or simply by the firm parts of the head. This view is also confirmed by experience." Further on (page 350), Politzer expresses the opinion that "in cases of synostosis of the stapes, the molecular vibrations of sound which are conducted directly to the labyrinth through the medium of the bones escape also toward the round window." Yet on this latter point we have no precise knowledge. The case just cited from Lucae, appears to prove, however, that this is not absolutely necessary.

The following remarkable passage in Hensen's work (page 26) ought to be revised at once. "When we can no longer hear a tuning-fork held close to the ear, the tone again becomes audible (we are speaking of the normal ear) when we place the handle of the fork against the teeth." Yet we know that this is directly contrary to every-day observation.

Since A.-C. in normal ears is always more powerful than B.-C., so that a T.-F. is heard longer and louder by the air than when applied to the mastoid process; and further, since in pure disease of the external and middle ear, in so far as the deafness has reached a certain degree,¹ B.-C. is more powerful than A.-C.; and finally, since it does not appear probable, either from theoretical considerations or practical observations, that pathological processes in the labyrinth or additionally in the auditory nerve could possibly increase B.-C., I think that I am invariably justified in concluding from an unequivocal preponderance of B.-C. over A.-C., that the sound-conducting apparatus has been subjected to some disturbance which by resonance or by obstructed exit of the waves of sound favors B.-C. at the expense of A.-C.

If there were any foundation for the reply which Jacobson makes to Dennert,² that "conversely, an affection of the sound-

¹ In slight degrees of disturbances of hearing, the cause which is supposed to intensify B.-C. may be so insignificant that it does not excite a distinct preponderance of B.-C. over A.-C.

² *Archiv f. Ohrenhklde*, Band xix., p. 48.

conducting apparatus might diminish the cranio-tympanic conduction of sound," the diagnostic value of B.-C. would suffer a grievous shock. But fortunately neither theory nor clinical experience compel us to believe in such an opinion, which Jacobson also, without being able to support with any positive evidence, can only verify by our lack of knowledge of the processes which take place during B.-C. in normal and pathological conditions. He confesses, however, that "in a vast majority of affections of the sound-conducting apparatus, the tuning-fork is heard much more loudly by B.-C. than in the normal condition."

Fully justified as the above conclusion appears, yet I gladly grant that there are difficulties in the way of availing ourselves of the same in the diagnosis of different diseases of the ear,—difficulties which can only be overcome by continued observation and, particularly, by post-mortem examinations. Amongst these are:

a. If the cases which applied to us for advice were simply those of pure diseases either of the sound-conducting or sound-perceiving parts of the ear, the affair would be simple enough, for I do not doubt that we, *e. g.*, in (bilateral) pure synostosis of the stapes, should always find a preponderance of B.-C., while on the contrary, A.-C. would preponderate in a case of purely nervous deafness. *But the first, and perhaps the chief difficulty of all, lies in this essential fact, that in practice we meet most frequently with mixed affections, so that the chief, if, indeed, not the only, question to investigate, is the relation in such mixed cases between A.-C. and B.-C., according to the variety and the degree of the affection then and there present.* This question, we must acknowledge, is one which has hitherto been sadly neglected, and which, as I think, can only be perfectly solved by the post-mortem examination of numerous cases which had been carefully examined during life. But inasmuch as we shall be forced from the very nature of the subject to wait yet a long time for such an agreeable fulfilment of our wishes, I shall simply content myself at present by making a few general remarks.

We must first ask ourselves whether, in cases of nervous deafness, the expected preponderance of A.-C. can be transformed by the simultaneous presence of anomalies of the sound-

conducting apparatus (e. g., by a plug of cerumen) into a preponderance of B.-C., and inversely. I believe that this question must be answered affirmatively or negatively, depending on the form and the degree of the existing affection. Any thing more accurate than this, has yet to be established. It is indeed well known that every affection of the external and middle ear does not equally cause B.-C. to preponderate over A.-C. (an occluding plug of cerumen, e. g., causes more marked preponderance of B.-C. than a simple middle-ear sclerosis), and I believe that in slight nervous affections B.-C. may be made to preponderate over A.-C. by simultaneous occlusion of the meatus. But on the other side, my own observations teach me to assert that in an affection of the sound-conducting apparatus (e. g., middle-ear catarrh) the expected preponderance of B.-C. over A.-C. can be weakened or even reduced to a minimum by a simultaneous affection on the part of the labyrinth, or, more generally speaking, of the perceptive apparatus.

This is seen in the following case :

A lawyer, æt. twenty-four, with musical proclivities, consulted me for excessive deafness which had gradually grown upon him in the course of years, but more noticeably in the last few months. The affection was referred by the patient to an attack of measles, from which he had suffered twelve years before. He and his father are both afflicted with a chronic nasal catarrh. The patient has observed that he occasionally hears much better for a while (for fifteen minutes to half an hour at the most), with a feeling as if the ear "were opened" as the hearing improved (tubal symptom?). Pain, vertigo, annoying tinnitus have never been perceived.

Examination shows: both *Mtt* opaque, with increased concavity; tubes somewhat constricted; whisper cannot be heard on either side (vocals only are heard); conversational voice, 50 *cm.* on either side, with frequent mistakes in naming the consonants. Watch (anchor movement) not heard on contact or by B.-C. A loud-ticking pivot watch is heard at 1 *cm.* from both ears; not heard by B.-C. All the notes of the piano are heard uniform and pure. The c fork (66 double-vibrations) is heard by A.-C., left ear, nearly till it dies away (— 10 seconds); the right ear hardly so long (— 60 seconds). The f^{sharp} fork is heard for a while on both sides by

A.-C. ; right not so long as left. The same is the case with the fork c^6 . The f^4 sharp fork cannot be heard by B.-C. no matter how hard it is struck, and with all the other forks, c^3 , c^1 , e , c , A.-C. preponderates distinctly over B.-C. With the c fork, A.-C. is better than B.-C. in the left ear, while in the right ear the condition is precisely the opposite, though hardly so well marked. Thus, if I applied the fork to the mastoid process after its tone by A.-C. had died away, the patient could not state precisely whether he really heard the tone again, or whether he heard the echo of the tone which had previously died away, plus the sensation from the sensitive nerves of the skin. The treatment, which could not unfortunately be continued for a sufficient length of time (only three or four weeks), was insignificant in its results. The local treatment consisted in an insufflation of a three-per-cent solution of potassic iodide through the catheter. We administered internally Karlsbad salts, potassic iodide, and resorted also to local depletion by the artificial leech. The naso-pharyngeal catarrh was also suitably treated.

There can be no doubt that this case was one of a mixed affection of the middle ear and labyrinth. If it had been a simple chronic catarrh of the middle ear, if the extreme deafness had depended simply upon obstructed (aërial) conduction of sound, we should, without question, have expected that B.-C. would predominate over A.-C. (as in thousands of similar cases). Moreover, if the labyrinth had been intact, we could not possibly have explained in so young an individual the total loss of B.-C. for watches, and particularly for the loud-ticking pivot watch. So in precisely the same line of thought, it was equally impossible to diagnose a purely nervous affection of the ear, when we had before us so many catarrhal symptoms, such as the occasional "opening" of the ears with distinct, although transitory, improvement in hearing, the appearance of the *Mt*, the simultaneous presence of naso-pharyngeal catarrh, etc.

All of these thoughts open up to us the question whether in such cases the preponderance of B.-C., which was to have been expected from the affection of the middle ear, has in any way been weakened or equalized by a simultaneous affection of the labyrinth ; or, in other words, whether the predominance of B.-C. always presupposes that the perception is more or less intact. Such a view as this appears to me theoretically and

clinically to have many things in its favor, for in A.-C., as usually observed, the vibration of the labyrinthian fluids (as a whole) undoubtedly develops a greater potential energy for the excitation (tetanization) of the fibres of the auditory nerve¹ than the simple molecular vibrations in the case of B.-C. We know, further—and this seems to me a point of great importance,—that not only does B.-C. diminish proportionately in its relation to A. C. in advanced years (with a simultaneous decrease in the perception of high tones, of which I shall speak anon), from a lack of excitability in the nervous organs, but that in cases of hysterical anæsthesia of the auditory nerve, B.-C. (and high tones also) ceases much sooner than the aerial conduction of sounds.

In mixed cases, therefore, we are obliged to consider two causes which come into play: The first, which intensifies B.-C. (by resonance), but which is not present to the same amount in all affections of the sound-conducting apparatus; and the second, which diminishes B.-C. in comparison with A.-C., and is dependent upon some affection of the nervous apparatus. Both causes can, of course, combine in the most varying degrees and amount, and the latter cause, so far as it contributes to our means of diagnosis, is much more difficult to discover than the former.

If we look at the subject in this light, the diminution of B.-C. in advanced years is to be judged from a diagnostic point of view, and not as a mere exception to the rule. Thus, if we happen to discover that B.-C. is diminished rather than increased in a case of middle-ear sclerosis in a patient of fifty or sixty years of age, this would mean that in addition to the affection of the middle ear, the patient was suffering from senile alterations in the labyrinth (organs of perception) which had reduced the preponderance of B.-C., as generally observed in such forms of aural disease. It would be instructive in such cases to determine whether in any anomalies of the resonance of the ear (such as the pressure of cerumen or artificial occlusion of the meatus) B.-C. might not still exceed A.-C. in amount.

Politzer, who, as it seems to me, unjustly grants less diagnostic

¹ Hensen: "Physiologie des Gehörs," page 106.

value to the relations between B.-C. and A. C. than to Weber's experiment, says of the conduction by bone and air ("Lehrbuch," page 785), that "by themselves alone they offer less accuracy than any other tests of hearing, since in numerous cases in which the objective examination undoubtedly indicated an affection of the middle ear with or without perforation of the *Mt*, Rinne's experiment had left him entirely in the lurch (*i. e.*, preponderance of A.-C.); and, on the contrary, in those cases in which other tests of hearing suggested that the labyrinth might be affected, he had found a preponderance in favor of B.-C." Despite this assertion, the very first question that we ought to put to ourselves would be, whether these exceptional cases were not perhaps of a mixed nature,—a point upon which Politzer does not touch at all, and which with the means at present at our command cannot always be accurately decided. Nevertheless, such exceptional cases as these are of value only when all their details can be accurately examined, and I confidently believe that a majority of all of these apparent exceptions can be easily explained by the axioms which I have just laid down. When, therefore, in a case of well-marked affection of the middle ear, A.-C. preponderates over B.-C., we must carefully search for any cause which may in any manner have altered the result which we had confidently expected to find, and so in the same way in cases of nervous deafness in which B.-C. unexpectedly preponderates over A.-C.

b. A further source of error, and one which, unfortunately, cannot be wholly eliminated, lies in the manner in which the hearing is tested, and here I refer chiefly to the locality at which the T.-F. is to be applied, and the sort of a fork to be employed. Concerning the first point, we may remark that it is well known, that any given spot upon the skull may differ exceedingly in its B.-C. powers, in comparison with every other point on the same side of the head. Still, and unfortunately for our method I think, it is a fact that the influence of the locality at which the T.-F. is applied, is much less than in Weber's experiment.

I will here venture to insert a self-observation of recent date. One morning I happened to notice that the act of combing my hair on the RIGHT side and near the vertex of the skull produced a very striking tympanitic sound. When I tapped on the same

region and especially on the upper part of it with one of my fingers, I could produce the same tympanitic tone, which strangely resembled the sound of a child's drum. Toward the occiput, the tone suddenly varied and became extremely dull. The phenomenon was not noticed on the LEFT side (with exception of over the left zygomatic arch). On the contrary it was quite audible on striking together the left teeth, but not so on striking the teeth on the right side. Repeated tapping with the finger on each mastoid process in succession failed to produce the tympanitic sound. A prismatic tuning-fork *c* when applied to some spots on the right portion of the vertex produced a loud deep-sounding tone, which seemed—though very indistinctly—to extend toward the left ear. There was, however, no unilateral intensification of sound either from the right or left mastoid process. On the contrary whenever I occluded either the right ear or the left, the tone was invariably heard in the ear which happened to be occluded. After I had syringed away from the *left* meatus a few crumbs of cerumen interspersed with hairs¹ the pathological resonance instantly ceased and did not return. This was, I may here observe, the only symptom noticed. For the time being, however, my own voice appeared somewhat intensified when I spoke louder than usual, but it was not sufficient to be in any way annoying. My hearing was not in any way disturbed during this phenomenon.

There can be no doubt that the crumb of cerumen or the minute hairs resting against the left *Mt*, had as I suspected, produced the peculiar resonance. The striking localization of the resonance (from the right vertex and the left teeth) is interesting. I imagine that this indicates the direction of the impetus, which at one time brought the hair into contact with the *Mt*, but not at others. The vibrations of the various tuning-forks were not powerful enough to cause such a motion, so that they did not produce the phenomenon at all, or so faintly as to be practically speaking, inaudible.

I agree with Luccæ, Emerson, and others in choosing the mastoid process as the most suitable location for applying the tuning-fork. For, according to my experience, the results when tested here are the most accurate, and less subjected to uncontrollable variations than, for example, near or on

¹ When I went to bed on the night before, I noticed, as I laid my head on the pillow a faint crackling sound in the *left* ear, and at once suspected that a bit of cerumen had fallen against the *Mt*.

the vertex. Yet it is an excellent plan to test B.-C. at other points on the cranium, in order to verify the tests which have previously been made on the mastoid process. *The T.-F. should always be pressed firmly against the bone, for if applied loosely the tone is heard much less distinctly.*

My experience teaches me also that there is another source of error to be found in the fact that the relation between A.-C. and B.-C., even in the normal ear, is not always the same for all forks, since low-pitched forks (large C, for instance) are heard better and with more facility by B.-C., than high-pitched forks (e. g., f^{sharp}). This circumstance seems to depend less upon the greater mass of the deep forks than upon the number of vibrations, and arises probably from the fact that the slower vibrations of deep forks possess a greater potential energy than in the case of high forks, and consequently are more capable of exciting vibrations in the bones and various organs of the labyrinth. This view seems to be favored by the fact that the sound of the high T.-F. dies away sooner than that of the low, and that the sensation on touching the C T.-F. is much more powerful than on touching the f^{sharp} fork, such as is used by Lucæ, although the fork in question is by no means small.'

Thus I feel the vibrations of the C fork distinctly with my fingers when the fork has almost ceased to vibrate and the tone is scarcely audible by A. C. But with the f^{sharp} fork it is quite another affair, for the sensation perceived by the fingers is very slight, even when we hit the fork a violent blow, and when it is giving off a shrill and forcible aërial tone, while the mere touch of the fingers to the prongs extinguishes the tone at once, which is by no means the case with deeper forks. It is to me passing strange that so little attention has thus far been paid to this relation between high- and low-pitched forks. Dennert¹ asserts, on the contrary, "that in diseases of the ear, the tones which are perceived by B.-C. *show much more constant relations*, so far as concerns the normal mutual proportions of the intensity of the sensation, than when the same tones are heard simply

¹ The prongs of the fork are 62 mm. long, 23 mm. broad, and 12 mm. thick.

² *Archiv f. Ohrenheilk.*, Band xx., page 5.

by A. C." For all that, I gladly see that my observations, which, without any such especial verification, ought to be clear to everybody, have lately been fortified and justified in a recent paper of Emerson's.¹

Emerson employed two tuning-forks, one, *a*, of 110 double vibrations, the other *c*² of 528 double vibrations, and discovered in fifty persons with normal hearing that the *a* fork was invariably heard *louder* by B.-C., the *c*² fork louder by A.-C. Additionally, he found that both forks were heard *longer* by A.-C. than by B.-C., but that the preponderance of A.-C. over B.-C. with the *c*² fork was much greater than with the *a* fork. He expresses the opinion that for *c*¹, the relation of A.-C. to B.-C. in normal ears is about 2 to 1; for *c*², 2.25 to 1; and for *a*, 1.72 to 1. If he had used forks of a still higher pitch, the difference would, in my opinion, have been still more considerable.

These experiments show (1) that very high forks, *e. g.*, *f*⁴ sharp, are not very suitable for testing the relations between A.-C. and B.-C.; (2) that we ought to unite upon an uniform shape and dimensions of the forks to be employed, for it is by no means a matter of indifference, whether the one observer is provided with a cylindrical and the other with a prismatic tuning-fork. So far as our present purposes are concerned, *c*², *c*¹, and middle *c* (66 double vibrations), provided with clamps, are quite sufficient. For other methods we should of course need a larger assortment. The normal relation between A. C. and B.-C. would then have to be arranged for each fork, as well as for the tones to be produced by the clamps. Finally, we should have to agree upon (3) fixed rules for the method of examination, in which respect again we should meet with many difficulties.

If we measure, *e. g.*, the duration of the perception by B.-C. and A.-C., we encounter at once the difficulty of invariably hitting the fork with the same force for both tests. If, however, we compare the intensity of the sensation by alternately holding the fork against the bone and then in front of the meatus, we can generally avoid the difficulty just

¹ These ARCHIVES, vol. xii., p. 63.

suggested, only we must bear in mind that the fact of hearing the fork louder, does not always coincide with hearing it longer. We must therefore pay attention to both of these points.

Emerson says that he endeavored to give the same force to the fork by hitting it always against his knee, and by taking care to hold it always at the same distance and in the same position with each person. When testing A.-C., the fork was held at half an inch from the auricle, and turned continually in order to avoid weariness and interference of the "deaf spots"; for testing B.-C. the fork was placed upon the junction of the mastoid and squamous portions (close behind the ear). The duration of A.-C. and B.-C. was measured separately in every case.

It seems to me that we might escape the errors arising from *any inequality in the force with which the fork has been struck*, by measuring the time during which the tone is still perceived upon the mastoid process after it has died away at any given spot, *e. g.*, in front of the orifice of the meatus and *vice versa*.

We should never strike the high-pitched, shrill tuning-forks too hard, or strike them any harder than is necessary, because we may transitorily diminish the amount of perception by excessive irritation of the organ of hearing (Jacobson).

If the difference between A.-C. and B.-C. is very slight, we shall obtain greater accuracy by verifying the results by repeated measurements, particularly in the case of poorly educated patients, whose answers under such circumstances are often far from trustworthy.

c. I have already mentioned that B.-C. is not always equally intensified in proportion to A.-C. in all diseases of the sound-conducting apparatus. I have found the preponderance most pronounced in occlusion of the meatus by cerumen, polypi, furuncles, fluids, etc.; further, in inflammatory swelling of the mucous membrane of the tympanum, particularly when any secretion is present in this cavity; also in cases of acute or subacute otitis media, with or without perforation of the *Mt*, as well as in chronic suppurative inflammation of the middle ear. On the contrary, I have found

it less marked, though always present, in simple chronic catarrh of the middle ear, during the stage of the so-called sclerosis ; a fact which can be explained by the circumstance that in this disease the opportunities for pathological resonance in the ear are present to a moderate degree only.

d. Finally, we must mention that in simple unilateral affections the result of our tests may be invalidated by the hearing of the healthy ear, although to a less amount than in Weber's experiment.

Before passing to the second part of this paper, I will venture to call attention to the testing of B.-C. by the watch, which of late years, and even as I confess by myself, has been wrongfully neglected. The following observation in the year 1869, appears to prove that Politzer is correct when he says¹: "*But despite this, we cannot dispense with the test of hearing with the watch, as a weaker source of sound, in cases in which we have to decide not only whether any vibrations can be heard at all by the bones of the head, but at the same time to get some idea of the extent to which the hearing has diminished.*"

A child æt. twelve, otherwise healthy, had suffered since infancy with naso-pharyngeal catarrh, with increasing deafness, which varied, however, in amount from time to time. Otorrhœa, pain in the ear, and tinnitus had never been noticed. The child's father, otherwise healthy, had suffered for years from chronic nasal catarrh and deafness. Examination showed both *Mt* normal in color and tint, but very concave ; excessive stenosis of the tubes, granular pharyngitis, and rhinitis. The anchor watch was not heard on either side ; the pivot watch on both sides in contact. *Neither of these watches could be heard by bone-conduction from any part of the skull, but the common small a' and c' tuning-forks, such as are found on sale in music shops, could be heard by B.-C. even when struck gently.*

The treatment, which was chiefly directed against the catarrh and persisted in for several weeks, was as little successful as that which had previously been undertaken by a brother aurist. Since then, the patient, as I have learned, has become *totally* deaf, and is obliged to rely entirely upon lip-reading in order to understand ordinary conversation.

¹ "Lehrbuch," p. 202.

This observation shows that tuning-forks, even when gently struck, transmit their vibrations along the bones of the skull with greater facility than watches (even the old-fashioned anchor watches with a very loud tick), and that until we discover something more suitable we should always employ watches in order to verify the results obtained by the T.-F. It appears to me, moreover, that for the purpose of securing the same *loudness* and *pitch* of the tick, we ought to agree upon at least two modes, the constancy of which would offer no difficulties when we recall to mind the perfection of the machinery now employed in the manufacture of watches.

I will not at this point discuss with any great degree of nicety the diagnostic value of Weber's experiment, which is based upon the fact that in cases of peripheral affections of the ear, the T.-F., when placed on the median line of the skull, is heard solely, or heard louder upon the diseased than upon the healthy side. Although Politzer asserts¹ that this method offers greater certainty in diagnosis than those which I have just described. I am sorry that I cannot agree with him, for on the one hand Weber's experiment is better fitted for unilateral affections, while, as is well known, a large majority of our patients suffer from bilateral disease; and on the other hand, the sources of error attached to this experiment are much more vital, since the place at which the T.-F. is applied—especially when both ears are more or less affected—exercises a decisive influence upon the results obtained, although, so far as we know, its precise amount has not yet been accurately defined.

II.

Bonafont² and Moos³ were the first observers to call attention to the fact that in many cases of nervous (labyrinthine) deafness the perception for high tones decreases much sooner than that for low tones. Since then the question of testing the hearing for the quantitative perception of high

¹ "Lehrbuch," p. 785.

² *Compte Rendu de l'académie des sciences*, May, 1845.

³ These *ARCHIVES*, vol. iii., part 1., page 113.

and low tones has been more carefully studied by Lucæ,¹ and by his pupils, Dennert and Jacobson.²

Lucæ believes that a remarkably good perception of the low tones in proportion to the remnant of hearing present, together with simultaneous diminution in the perception of high tones, points with great probability to a disease of the labyrinth (or, more generally expressed, of the nervous parts of the organ of hearing).

Now it is a fact that the normal ear is more sensitive to high tones than to low, and clinical observation teaches us that in a great majority of diseases of the external and middle ear, high tones are perceived more readily than those which are low.

When, therefore, in a case of undoubted labyrinthine or so-called nervous deafness, we meet with precisely the opposite condition³ (low tones heard better than high tones) it is a fact which is worthy of our very careful consideration. We will, however, at once remark that such a condition is by no means exceptional, for cases have been reported in which the perception for all tones was uniformly diminished, or in which, inversely, the low tones were not heard at all, or at the best but slightly. Yet as we meet with general as well as localized morbid processes in the labyrinth, we ought not to be surprised if these should at one time affect the low tones only, and at another the high tones alone.

Long-continued and persevering observation must teach us to which forms of labyrinthine (nervous) deafness this condition of which we are speaking is peculiar, and whether it deserves any general significance, *perhaps in the sense that in the perception of high tones much greater demands are made upon the sensibility of that portion of the labyrinthine apparatus involved, and consequently that the function of this portion is much more easily and much more rapidly interrupted by increased waste and pathological processes than happens elsewhere.*

¹ *Archiv f. Ohrenhlkde*, Band xiv., page 134; Band xv., page 273; Band xix., page 73.

² Dennert: *Berlin. klin. Wochensch.*, 1881, No. 18, and *Archiv f. Ohrenhlkde*, Band xx., page 1. Jacobson: *Archiv f. Ohrenhlkde*, Band xix., page 44.

³ Lucæ has described two such cases (*Archiv f. Ohrenhlkde*, Band xv., age 273), which he observed during life and examined after death.

Such a view as this appears to me to gain considerable degree of probability from the following considerations and observations :

*a. Many interesting observations have already been made in cases of hysterical anæsthesia of the auditory nerve.*¹ I have already remarked that in such cases as these, B.-C., invariably ceases sooner than A.-C., and in the same manner, according to Walton, the high tones appear to be lost sooner than the middle or deep tones (in a case of Westphal's, from *c*⁸ upward), yet bone-conduction ceases even in the milder forms of hysterical anæsthesia sooner than the perception of high tones.

b. In advanced age also we meet not only with a decrease in B.-C., in contrast with A.-C., but with diminished perception of the highest tones, so that, e. g., the chirping of a cricket can no longer be heard (I would suggest that the diminution in the perception of the highest tones has been less carefully examined than the proportional diminution of B.-C. in comparison with A.-C.). Both conditions have been correctly referred to senile torpor of the auditory nerve and its terminal apparatus.

c. In the same way the perception of high tones appears to decrease first of all in those occupations which are carried on amidst noisy surroundings.

d. Finally, I would call attention to the following fact: There can be no reasonable doubt that the potential energy which is necessary for the excitation of the nervous terminal apparatus of the nerve of hearing is much more powerful at the entrance, in the lowest convolution of the cochlea than in the superior or uppermost convolutions. We should then have to recall to mind² that the wave which enters at the base of the cochlea does not simply extend as far as the helicotrema,³ but passes along the entire tract through the elastic membrana basilaris toward the scala tympani, and in so doing excites the acoustic terminal organs. During all

¹ Ueber die Taubheit bei hysterischer Hemianæsthesie. Von Walton : "Verhandl. der Berlin. physiolog. Gesellschaft.," 1883, Band ix., page 2. Reference in *Monatschr. f. Ohrenheilkde*, 1883, page 70.

² Hensen : "Physiologie des Gehörs," p. 106.

³ According to Hensen, the helicotrema serves as a sort of compensator in slow alterations of pressure.

this time, however, it is losing its energy as it overcomes, one by one, the various obstructions in its path. *If now the portions attuned for the high tones are placed, contrary to the space at command in the lowest convolutions of the cochlea, we have a right to suppose that this arrangement was so effected because it is more difficult for high tones to excite the nervous terminal apparatus concerned than it is for those in the middle or lower octaves.*

If we look at the subject from this point of view, we could easily explain the greater sensitiveness of our ears for high tones, as well as the fact that these tones are earlier lost to hearing. We could thus also easily comprehend how it is that in B.-C. the deeper tones predominate over the high, for in this process the advantages offered to the organs for the perception of high tones by the internal arrangement of the cochlea do not come into play. I leave aside all consideration of the question whether there is any connection between this supposed situation of the organs attuned for high tones and the perception of a very high-pitched subjective ringing sound whenever our ears are exposed to a violent explosive noise, as well as how far the high-pitched proper tone of the drumhead and meatus must be considered during this phenomenon.

Let us now turn to the diagnostic value of the symptom which we have so long been discussing. Luca¹ describes the importance of Rinne's experiment, and remarks that if it results negatively, we have a right to diagnosticate a disease of the sound-conducting apparatus, but at the same time we cannot absolutely exclude a simultaneous affection of the nervous portion. He then continues: "In order to examine this last point, we finally test the aerial conduction of sounds which lie in the very high (four times scored) octaves, for these tones, as experience teaches us, can still be perceived passably well, even with very decided obstructions in the sound-conducting apparatus, while in disturbances of the percipient nervous apparatus they are heard very slightly or not at all."

I should hardly dare to give utterance to views so posi-

¹ *Archiv f. Ohrenhklde*, Band xix., p. 74.

tive as these, and Lucæ expressed himself with much more reserve in his previous papers.

1. It must be confessed, to start with, that there are diseases of the nervous apparatus in which the perception for high and low tones is uniformly diminished. These cases are rare, yet they do occur,¹ as I can confirm from my own observation. And Dennert also² says that the uniform diminution of the perceptivity for high and low tones is the one most frequently met with, and that it is observed in diseases of the *external as well as of the internal ear*. Therefore we have no right, in the absence of this symptom, to conclude that the perception of sound is unimpaired.

2. And what is worse, the opposite condition (diminished perception for low tones in comparison with high tones) appears now and then to occur, and not in cases of pure bass-deafness solely. We can, however, easily disregard this symptom, for, on the one hand, it will not place any difficulties in the way to a correct diagnosis, since the loss of a limited series of tones alone indicates, and in no uncertain manner, that the labyrinth has become affected,³ while, on the other hand, it is plain enough that there can be general as well as localized affections in the labyrinth (cochlea) also, and that the earlier loss of the perception of high tones can only be relied upon in the diagnosis of diseases of the first group. But there seem, unfortunately, to be observations from which we cannot so easily escape: labyrinthine or nervous affections of a more general nature, in which in a similar manner the low tones are less distinctly heard. With this particular group of cases, I regret to say that I have had no personal experience, but I have lately discovered by accident a case reported by Moos⁴ which appears to belong to this class.

Moos describes the case as follows: Affection of the organ of

¹ Amongst cases of this sort is to be reckoned one reported from Lucæ's polyclinique, *Archiv f. Ohrenhklde*, Band xv., p. 134, "Ueber Nerventaubheit nach Epilepsie."

² "Zur Analyse des Gehörorgans," *Berl. klin. Wochenschr.*

³ The only circumstance that might lead to an incorrect diagnosis would be the coincidence of bass-deafness with a general decrease of the hearing from chronic catarrh of the middle ear.

⁴ These ARCHIVES, vol. iii., part 1, p. 120.

hearing, presenting the symptoms of so-called Ménière's disease ; deafness of the right ear ; permanent deafness as regards the lower tones ; return of the perceptivity for the high tones ; partial return of the perception of speech. The lower notes of the piano up to middle *f* were not heard at all ; from middle *f* upward they became progressively more and more distinct. During the first few days no tuning-forks could be heard (*A*, *C*¹, *C*²) either by *A.-C.* or *B.-C.*, while the hearing for the watch, as well as for the voice, was very much reduced. The patient suffered from repeated attacks of vertigo, vomiting, and extremely loud tinnitus.

This could not possibly have been a pure deafness for bass notes—*i. e.*, a morbid process localized in the uppermost convolutions of the cochlea, because the original deafness of the ear affected was general and not localized, and when we come to consider the whole case we can see no reason why, in total diseases also of the labyrinth or cochlea (exudations, hemorrhages, etc.), the subsequent process of contraction might not at one time more seriously affect the lower and, at another time, the median or upper portions of the lamina spiralis. *We shall consequently see in the preponderance of the lower tones over the high, a symptom which is well worth considering ; yet, neither the total absence of this diagnostic point, nor precisely the opposite condition, would justify us in asserting that the cause of the deafness could not possibly be ascribed to a labyrinthine disease.*

If I am correct in my conjecture, that the vibrations of the high tones have greater difficulty than the slow (deep) vibrations¹ in mechanically exciting the fibres of the auditory nerve, I could easily imagine to myself in what sort of cases we might expect to find the low tones favored in contrast with the high tones : 1. In cases of general diminished excitability of the fibres of the auditory nerve, as, *e. g.*, in hysterical paresis of the auditory nerve, in senile torpor of the nervous portions of the organ of hearing, in a blunted condition of the labyrinth due to noisy occupations. 2. In conditions which, on the whole, uniformly diminish the

¹ I have already pointed out while discussing the question of *B.-C.*, that the vibrations of low tuning-forks cause a disproportionately forcible sensation to the finger with which they come into contact, and that when tested by *B.-C.* they are perceived more loudly and much sooner than the high forks, despite the more intense aerial tone which the latter give off.

vibratory energy of the tuned apparatus of the labyrinth, *e. g.*, rigidity of the organs of Corti, and perhaps also in conditions of increased labyrinthine pressure. In the latter point of view we should be obliged to recall to mind the experiments of C. H. Burnett,¹ according to which the excursions of the round window and of the ossicles diminished and even ceased when the labyrinthine pressure was increased beyond a certain limit, *and sooner in the case of high tones than with low.*

We now have to examine the question whether also in diseases of the sound-conducting apparatus, low tones have ever been known to be heard better than high tones. Politzer affirms that this is so,² without, however, going very deeply into the subject, and yet it would be of the most exciting interest to study these exceptional cases more closely, for it is unquestioned *that in a great majority* of middle-ear diseases, the high tones are undoubtedly heard far better. We know that increased tension of the *Mt* favors the transmission of high tones rather than low, and Politzer himself³ demonstrated years ago that if we artificially weight the ossicles (*e. g.*, with a small bit of wax), *their excursions are less extensive to low notes than to high*, and he remarks additionally that the reinforcement thus granted to the high tones coincides with clinical observation in cases of adhesions and anchylosis in the middle ear. While this assertion finds an application in numerous recorded cases of sclerosis of the middle ear, Wolfe⁴ has likewise come to the conclusion, so far as concerns his careful investigations into perforations and defects in the *Mt*, that the higher the fundamental tone of a consonant lies in the scale, so much the easier will it be perceived.

The question of the influence of pathological conditions

¹ These ARCHIVES, vol. ii., part 2, p. 51.

² He says, page 784 of his "Lehrbuch": "Although this method of examination has obtained a certain diagnostic value, yet a diagnosis of an affection of the auditory nerve *ought not to be based upon this test alone*, because low tones are sometimes perceived better than high tones, even in diseases of the middle ear, while inversely the perception of low tones has been known to decrease more rapidly than the perception of high tones in well-established affections of the labyrinth.

³ *Archiv f. Ohrenhklde*, Band vi., p. 35. "Lehrbuch," p. 74.

⁴ "Sprache und Ohr," p. 177.

on or about the *intrinsic muscles of the ear*, upon the perception of high and low tones, has not yet been sufficiently investigated, and yet I cannot believe that our diagnostic conclusions have suffered much in this respect. As for the tensor tympani, we should have to consider increased tension chiefly, or such similar causes as are supposed to increase the perception of high tones over low. Concerning the stapedius we are still less informed. In facial paralysis the symptoms on the part of the hearing do not appear especially important, and all the clinical observations that I have been able to collect, contradict one another exceedingly, some observers discovering a partial diminution of the acuteness of hearing, others an increased sensibility, an abnormal acuteness of hearing for all musical tones, especially for low tones.¹ Finally, I would remark that Mach and Kessel experimentally discovered, on exercising tension upon the stapedius (as well as the tensor tympani), that the excursions of the ossicles were slightly diminished, but that there did not appear to be any preponderance in favor of the perception of high tones over low tones or *vice versa*.

¹ In a case of facial paralysis, observed by Moos, the acuteness of hearing for low tones on the affected side was double that upon the healthy side.

CALOMEL IN THE TREATMENT OF OTORRHŒA.

By J. GOTTSTEIN, Breslau.

Translated by Dr. J. B. McMAHON, New York.

WHEN Bezold, in 1880 (*Archiv f. Ohrenheilk.*, Bd. xv., Heft 1), introduced boric acid in the treatment of purulent otitis, he acted on the correct idea that in order to carry out a thoroughly antiseptic treatment of the ear, this organ must not only be rendered temporarily aseptic by injections made once or several times daily, but that the entrance of the injurious agents contained in the air must be permanently prevented. He insisted also upon these two requirements in antiseptics intended for use in the ear: First, the remedies should be free from any irritant effect on the mucous membrane of the middle ear; and secondly, they should form, neither in nor upon the mucous membrane, deposits difficult of removal.

That the impalpable boracic acid satisfied those requirements better than other means, and that its introduction should be regarded as a positive advance in the treatment of otorrhœas, is proved by the universal recognition of its worth and the rapidity with which it has been adopted by all aurists.

While the advantages of this remedy are great, and I have learned to value them fully, it cannot be denied that the remedy fails in a considerable number of cases, and the result is often relatively tedious. This occurs not only in complicated cases (with destructive bone processes, ad-

vanced pulmonary phthisis, inflammation of the upper part of the tympanic cavity, and perforation of Schrapnell's membrane), which Bezold has already excluded in his estimate of the value of the boric-acid treatment, but it happens also in simple suppurations, in which the result depends either exclusively or in great part on the maintenance of antiseptics. It is admitted that boric acid is one of the weaker antiseptic agents. It is on this account that various authors have sought for more efficient antiseptic methods of treatment suitable for the ear. As substitutes, iodoform and corrosive sublimate (Wagenhäuser) were proposed, and, still more recently, by Bürkner, red precipitate in conjunction with sublimate.

The iodoform has proved satisfactory in no way. I myself have no experience with the red precipitate, but the communications of Bürkner establish beyond doubt the very limited range of its utility. The sublimate, which has a most extended application in surgery on account of its powerful antiseptic properties, satisfies only one requirement in the treatment of otorrhœa—namely, to render the ear temporarily aseptic. It does not fill the other equally imperative indication, to exclude permanently the disease germs as far as possible. This must be sought in another way and by other means.

I have for some time employed solutions of corrosive sublimate (of varying strength) as injections or instillations, but have always supplemented their use with insufflations of finely powdered boric acid. For cleansing the ear, I prefer injections of the sublimate to other means, but I cannot assert that its use in conjunction with the boric acid has materially contributed to hasten the cure of otorrhœas. On the other hand, I believe that I can recommend the combined use of calomel and sublimate as a method not only of equal value to the boric-acid treatment, but one which in many cases produces a more prompt and decided effect.

I assume that corrosive sublimate is formed when calomel is acted on by fluids containing sodium chloride, and, therefore, by pus. That sublimate has markedly anti-

septic properties is beyond doubt ; it is probable, moreover, that these are more intense in the nascent state.

So far, then, as antiseptics is concerned in the treatment of otorrhœa, the most favorable conditions seem to obtain. But there remains the question if the other conditions, which, following Bezold, we have described as measuring the efficacy of the therapeutic agent, are also fulfilled ; and finally how the results of experience correspond with our suppositions.

So far as I can learn from the literature at my disposal, Wendt was the first to recommend calomel as a local application in purulent otitis. To what extent he has used it, I do not know. He states only (*Archiv f. Ohrenheilk.*, Bd. iii., page 28) that he has frequently made insufflations of alum or calomel through a quill in cases with large perforations, when the secretion had diminished and the swelling of the mucous membrane somewhat subsided, and that he prefers the calomel on account of its insolubility, and because its action is therefore that of a purely mechanical irritant. I cannot determine if other authors, following Wendt, have tried the calomel. In the most recent text-book on diseases of the ear, that of Urbantschitsch, I find the general remark : "Calomel is also recommended for insufflation into the ear." The same author refers also to the occasional favorable action of the mercurial preparations in general in purulent inflammations of the middle ear. Neither Wendt nor Urbantschitsch have employed it as an antiseptic agent ; the latter includes it among the astringents.

During the past year, I have used the calomel by way of trial in a number of cases that have seemed suitable, especially such as could be submitted to daily observation.

I have satisfied myself (1) that the remedy is absolutely free from irritation to the mucous membrane of the middle ear ; (2) that it forms neither upon nor in the mucous membrane any precipitate difficult of removal ; (3) that surprising results are often attained under its use.

Accordingly, since the beginning of the present year, I have, in my private practice as well as in my polyclinic, employed calomel in the treatment of all cases of otorrhœa

in which, following Bezold's direction, I had previously made use of boric acid alone, or as a supplementary means. I withheld the calomel only from such patients as, coming from a distance, I had an opportunity to see but once.

My observations now exceed eighty in number, so that I feel justified in communicating the results of my experience with this method.

My method of procedure is as follows: The ear is, in the usual way, syringed carefully with a weak sublimate solution (one tenth per cent.); the residue of the secretion is forced into the external meatus by the employment of Politzer's method, and then removed by syringing; and, finally, the ear is well dried with cotton.

The calomel (vapore parat.) is then blown in through a powder-blower,¹ and the auditory canal closed as well as possible by means of cotton. The further treatment is the same as with the boric acid.

Before I go further, I would answer the possible objection, that the effects which I attribute to the calomel are really the result of the sublimate injections.

To this I may say that, on the one hand, the use of the sublimate, even when employed in conjunction with boric acid, has not shown equally striking results; and, on the other, the value of the calomel treatment remained the same when injections of other solutions than the sublimate were resorted to.

I shall, later, return to the question of the correctness of the assumption that a partial conversion of the calomel into corrosive sublimate occurs.

When I review the results of the calomel treatment, I can state, by way of preface, that it possesses all the advantages justly attributed to the boric acid, while, in some respects, it is superior to it. It is so absolutely devoid of irritation to the mucous membrane of the middle ear that I

¹ In my consultation hours, I make use of the powder-blower of Kabierski (*Centralblatt für Chirurgie*, 1883, No. 33), which I have found, after long trial, the most suitable for the treatment of the ear as well as of the nose and larynx. It has the advantage that it does not need to be filled for each case, that the insufflation can be made with ease and accuracy during the examination of the parts, and, finally, a separate tip can be used for each patient, a measure necessary for the attainment of a thorough antiseptis.

have employed it with advantage even at the beginning of acute inflammations.

The powdered calomel is applied easily and removed without difficulty. Whilst boric acid has a tendency to mass itself into lumps, and so close the tube of the insufflator, and also to form with the pus masses in the external meatus, the calomel, from its absolute insolubility, always remains in a finely divided condition, never blocks the insufflator, and does not enter into mechanical combination with the pus in the meatus.

However, these are minor advantages, which would not determine the exclusion of the boric acid.

That on which I lay the most stress is that calomel, in my opinion, has a much more certain and decided antiseptic action than the boric acid.

I am anxious to avoid the error into which those authors fall who overestimate the value of the remedies recommended by them. Calomel also fails in some of the cases in which powerful antiseptic action is desired, because considerable tissue alterations in the drum-cavity are absent. Yet I have, with no method of treatment, not even with the boric acid, attained such speedy results as with this remedy in acute as well as in chronic forms of otorrhœa.

There is a surprising diminution of the discharge in the first few days almost without exception ; in acute cases, however, which come early under treatment, the discharge of pus remains the same for from two to four days, and then undergoes a rapid decrease. I have never observed any unpleasant effect, local or systemic. I would mention here that I have been informed by my cousin and friend, Dr. A. Gottstein, Berlin, who, at my request, has made use of the calomel treatment at Hartmann's Policlinic, that under its use a slight stomatitis was noticed in a weakly exhausted child. I myself have never noticed any changes in the gums, though I have in many patients employed the calomel for weeks.

As for the therapeutic results of the calomel treatment, I can base my judgment only on eighty cases which were not complicated with formation of polypi, necrosis, etc.,

and which, further, I could keep under observation during the whole course of the disease. Every aurist knows how unsatisfactory the treatment of otorrhœa is when carried out by the patients, especially if they are of the poorer classes, and that there is no possibility of an efficient antiseptis under such circumstances. I accordingly hold fast to the principle to have otorrhœa patients come daily, if possible, to the Polyclinic for treatment.

From this point of view there are to be considered fifty-seven cases, twenty-seven of acute and thirty of chronic otorrhœa. I do not consider it advisable to give the average duration of the treatment, because the observations are not sufficiently numerous to eliminate the variations arising from marked peculiarities in individual cases. I prefer to draw special attention to the most favorable and most unfavorable cases.

Of the acute cases, twelve were discharged cured in the first ten days, ten between the tenth and twentieth days, and three after this period. Two cases became chronic and are still under treatment. One of these two patients was tuberculous. He had previously been treated with boric acid with the same lack of success. He was not aware of the affection of his lungs; it was only when I sought to discover the cause of the delay in the cure, for which the local conditions offered no satisfactory explanation, that the microscopic examination of the sputa showed the presence of of tubercle-bacilli, and physical examination of his lungs detected the signs of disease. Among the patients cured also was a tuberculous individual. The discharge in this case had ceased by the ninth day, the perforation had closed, but there remained considerable hardness of hearing.

Of the thirty chronic cases, thirteen were cured within the first ten days, seven between the tenth and twentieth days, between this and three months, seven; two remain uncured. The final result is not known in one case which was beginning to improve. One of the unsuccessful cases had previously been treated with boric acid, and also with caustics after the method of Schwartze.

The most important result of these observations, in my

opinion, is not the fact that the majority of the cases have ended in cure (which is due in part to the exclusion of the complicated cases), but that the cure has been effected in a very short time in a proportionately large number of the cases.

Among the acute cases were some very severe inflammations of the middle ear. The following may serve as an example :

A boy of eight years was attacked with otitis, right, at the beginning of an outbreak of measles ; left, two days later ; both resulting in perforation and otorrhœa. In spite of careful treatment by the family physician, Dr. Goldschmidt, who used syringing and boric acid, the suppuration continued. After three weeks a mastoid periostitis, right side, developed with marked fever and severe pains in the head. Thereupon my colleague, Dr. Goldschmidt, referred the patient to me for treatment. By the second day the suppuration on the left side had permanently stopped, on the right there was diminution of the discharge and a cessation of the signs of inflammation of the mastoid process. On the fifth day of the treatment there was a new development of fever, headache, and tenderness in the mastoid region. The auditory canal was found dry, and no perforation was to be seen. Treatment consisted in paracentesis of the drum membrane, evacuation of pus with the air-douche, syringing with sublimate, and insufflation of calomel. Improvement followed. On the sixteenth day of the treatment complete recovery, perforation closed, and hearing good.

Among the chronic cases cured were some which had lasted for years and had been repeatedly treated by different methods without success. In a number of cases of otorrhœa in which the sublimate and calomel treatment proved, after some time, ineffectual, I changed to the boric acid or to the caustic method without, as a rule, obtaining better results. In one case, however, in which the only result of the use of the calomel for several weeks had been a diminution of the secretion, the suppuration ceased after the second insufflation of the boric acid.

I freely concede that my observations so far are not sufficient to determine, with any but an approximate accuracy, the relative merits of the treatment I recommend, as com-

pared with other methods. I have in order to obtain a basis for comparison, treated patients suffering with an otorrhœa of both sides, with the sublimate and calomel for one ear, and boric acid for the other. For this purpose I have generally selected acute cases as presenting less difference in the local conditions of the two ears; yet, although these comparative tests give results favorable to the calomel, I cannot consider them as conclusive, for under similar treatment of both ears, we often observe considerable difference in the duration of the disease on either side; a large number of observations will be necessary to decide the question.

The calomel is also suitable, as is the boric acid, for employment after operations in the middle ear, cauterization with nitrate of silver, the use of the galvano-cautery, and in conjunction with the alcohol treatment. In these cases, the powerful antiseptic action of the remedy is conspicuous.

At first I hesitated to recommend the calomel to patients for home use, but my fears have been without foundation, as the remedy is absolutely free from danger, and I can now record some cures even under the home treatment.

As I set out with the belief that the action of the calomel was due to the formation of sublimate by its partial combination with the chlorides contained in the pus, I have added some table-salt to the solution of sublimate used for injection, in order to ensure and further the supposed chemical process. I cannot say that I have noticed any essential advantage, any shortening of the process of cure, result therefrom.

With the same intention, I have had the calomel triturated with salt, and so used it. This led to the interesting observation that the salt and calomel powder has a weak caustic action. I endeavored to utilize this action therapeutically in otorrhœas with large perforations and considerable swelling of the mucous membrane of the middle ear, by insufflating the salt and calomel and allowing it to remain in the ear twenty-four hours. The powder caused some pain, lasting several minutes, and a temporary increase

of the secretion. On the following day, after removal of the powder and the pus, the mucous membrane of the promontory was found covered with a thin, grayish-white layer, similar to that produced by nitrate of silver. I do not repeat the insufflation of the powder till this layer has separated, but meanwhile employ the pure calomel. In this way I have repeatedly caused diminution of the swelling of the mucous membrane and cessation of the otorrhœa.

I have also found at times after the use of the simple calomel, a whitish, frost-like deposit on the mucous membrane; Bürkner (*Berl. klin. Wochenschr.*, Bd. lxxxiv., No. 1) reports likewise that he has observed a whitish coloration of the mucous membrane after the use of the sublimate injections merely.

Although, after the results I have obtained from the calomel treatment, the question of the correctness of my view, that the calomel undergoes a conversion into the sublimate in the middle ear, has no bearing upon the value of the method, I have sought to obtain positive proof in the matter. I placed in alcohol a number of tampons saturated with pus, which had been removed from the auditory canals of patients under the calomel treatment, without the sublimate injections. In alcohol the calomel is insoluble, the sublimate soluble. Julius Muller, druggist, was friendly enough to make the chemical examination, in the following manner: The alcohol, with the suspended tampons, calomel, and pus were placed in a water-bath and complete evaporation allowed to take place. The residue was repeatedly treated with alcohol at a temperature of 30°–40° Cent., and the filtrate again evaporated as before. The trifling residue was treated with water and hydrochloric acid, the solution filtered, and the filtrate examined by the well-known delicate tests for mercury.

The result was negative—no trace of mercury could be found.

Nevertheless, I hold to my belief that the conversion of the calomel into the mercuric chloride in the middle ear does take place. In favor of this view, we have the analogous behavior of calomel when applied to the conjunctival sac; sec-

ondly, the efficiency of this remedy in otorrhœa, which admits of no other explanation on account of the insolubility of the calomel; furthermore, the resemblance of the local changes which sometimes occur in the mucous membrane to those produced by the sublimate; and finally, the observation made by Dr. A. Gottstein, of a stomatitis after the application of the calomel to the ear.

The negative result of the chemical examination is probably due to the fact that the sublimate in a nascent state enters into a combination with the albumen of the secretion, forming an insoluble albuminate.

I should like to have determined if mercury could be found in the urine during the calomel treatment. The policlinic is poorly adapted, however, for such investigations. I propose to discuss these questions in future communications. For the present I shall but add that in many patients a grayish dark deposit is found in the discharge after the insufflation of calomel. This is doubtless the oxide of mercury, a proof, at all events, that the calomel undergoes a chemical change.

I am now engaged in determining if the irritant action of the salt and calomel can be avoided by the use of a smaller quantity of the salt, and if we can prevent the formation of the albuminate of the mercuric chloride, which in my opinion takes place. Finally, my communication may perhaps induce surgeons to try calomel as a dressing in conjunction with sublimate in smaller ulcers, a practice long since in vogue for condylomata and specific ulcers.

A CASE OF TEMPORARY SUDDEN RESTORATION OF HEARING AFTER DEAFNESS OF TWENTY-ONE YEARS.

By BASIL NORRIS, M.D.

SURGEON U. S. A.

Mrs. Johanna Williams, of Washington, D. C., had been profoundly deaf for twenty-one years. In August, 1881, responding to a message, I was met by her with the cheerful assurance that she could hear as well as she ever did in her life. This lady, who was an acquaintance of some years' standing, surprised me by conversing easily, sitting apart and speaking as we did in a moderate tone of voice. On a previous evening at home, in company with her daughter and a visitor, she enjoyed the conversation and discovered that she was no longer deaf. The following morning she was awakened by a grandchild four years old, whose voice was plainly audible; sparrows on the tin roofing of a back building attracted her attention, and caused her to get out of bed and walk to the window. She heard the milkman arrive, the street cars in motion, footsteps on the pavement, a creaking door, voices outside, and conversation at the table. At market she was confused by a multiplicity of sounds, and becoming faint, sought the assistance of a gentleman to conduct her from the building. Perfect hearing lasted three weeks; she had heard pretty well on two former occasions for two or three days, and was therefore prepared for the relapse which she predicted. The cause of deafness was purely nervous. "I saw from the window," says Mrs. Williams, "the red flag of the auctioneer before the door, and from that moment, and as quickly as that [slapping her hands together], I lost my hearing. It was summer, and there was a terrific storm in the evening; I did not hear it thunder."

Under the heading of nervous deafness, Lawrence Turnbull, in his clinical manual of diseases of the ear, p. 338, quotes a case from Hinton, as follows: "B. H.," at the age of twenty-two, being then in perfect health, and in the possession of all his faculties, was about to call on the parents of the lady who afterward became his wife, but on the morning of the proposed visit he woke up almost entirely deaf. They could not make him hear any thing. Hinton remarks that unquestionably we all of us in our time have felt, or may hope to feel, happily nervous under circumstances like the patient's, but growing stone-deaf under them, he adds, unless it be to an unfavorable reply, is a phenomenon which pathology refuses to accept. It was discovered that this patient suffered an injury to the vertex from a fall of twenty feet down stairs four years previously. Under the same classification of nervous deafness is the case of "I. M.," aged sixty, totally deaf for twenty-five years. The cause assigned by the patient was sudden loss of property, but upon close inquiry he stated that he had a brother as deaf as himself.

I have seen Mrs. Williams to-day, May 12, 1884, at her residence, corner of 9th and 11th streets. She is fifty years of age, active, strong, and cheerful. She says of her numerous family, not one of them was deaf, nor had she suffered from any injury of the head.

A CASE OF OBJECTIVE NOISES IN BOTH EARS.

BY A. R. BAKER, M.D., CLEVELAND, O.

Nora D., girl, æt. thirteen, referred to me for treatment by Dr. Nichols, of Bradford, Pa., April 16, 1884, suffering from persistent objective and subjective noises in both ears. Good family history, and, with the exception of more or less sore-throat and subject to taking cold, previous history good. Present condition somewhat anæmic; rather small for age; not well nourished. Heart normal; appetite good; bowels regular, and she would sleep well if it were not for noises. All the other functions performed normally, so far as I can discover. Tonsils very much hypertrophied; post-nasal cavity covered with a tough, sticky secretion; nostrils free from obstructions; Eustachian tubes open; ear-drums normal and not retracted; no twitching of palatine or other muscles; swallows without difficulty; hearing slightly impaired (?).

A snapping noise can be heard distinctly at a distance of four feet from right ear, and at eighteen inches from left. The noise continues in each ear independent of that in the other; and is of a much higher pitch and more frequent in the right. The noise sounds very much like that which can be made by snapping the finger-nails. I counted never less than twenty or more than thirty-two per minute in right ear, and about five less in the left, and almost as regular as a clock ticking. Her father says he has counted quite frequently, both when she was asleep and awake, with about the same results. The noises were not influenced by respiration, talking, mastication, swallowing, walking, position, or any thing I could think of which might exert an influence upon it. Dr. Nichols and her father unite in saying the noises are much louder at times, and can be heard across the room. Patient says the noise sounds to her as loud as the firing of musketry in the

same room. She says the noise frequently stops for a few minutes, only to commence louder than before. She don't know which she dreads the most—to have the noise stop or to have it commence again. She lives in constant fear of one or the other. She says there has not been an hour at one time during the past year in which she has not heard the noise. It has been much louder during the past two or three years than formerly, but can not remember the time when she and her friends could not hear noise in her ears. The noise often keeps her awake for hours at night. It annoyed her so much that she was compelled to leave school. Her father is afraid she will become insane if she does not get relief.

I removed the hypertrophied tonsils and ordered the post-nasal cavity to be brushed with a ten- or twenty-grain solution of nitrate of silver, and the use of Politzer's air douche twice weekly ; and gave cod-liver oil, bitter tonics, and iron internally.

I was unable to keep the case under my observation, but saw her again Aug. 19, '84. Patient has improved in general condition so that I scarcely recognized her as the same girl I saw four months previously. Hearing normal, post-nasal cavity free from secretions and mucous membrane healthy in appearance, pharynx in good condition. The objective and subjective noises gradually improved for several weeks, and at the end of two months had entirely disappeared. The patient can, however, by a voluntary effort cause noises to return in right ear, and occasionally can do so in left, but can offer no explanation of how she does it. When she has started the snapping noises they continue independent of any voluntary effort, until she makes such an effort to stop them. They continue uninterrupted during suspension of breathing, during conversation while her attention is purposely called to various subjects, and retain the same essential characteristics as to loudness, pitch, frequency, etc., as when they were involuntary.

An explanation of the cause of the peculiar snapping noise in the above case puzzled me considerably. I was inclined at first to exclude any spasmodic muscular action because the patient was sensible of none, and there was none to be recognized by myself, and attribute the noise entirely to the influence of the air during respiration upon the sticky mucus in the Eustachian canal. The results of treatment would rather sustain this view of its pathology. But there

were a number of features in the case which could not be accounted for by this hypothesis, and I was forced to the conclusion there must be spasmodic muscular action near the Eustachian tube, probably the upper fibres of the superior constrictor of the pharynx, as suggested by Burnett.

The enlarged tonsils were undoubtedly the exciting cause of the spasmodic trouble, and the great improvement in general condition had much to do with her rapid recovery. Possibly her age—just arriving at puberty—may have exerted an influence on the case for the better, independent of treatment.

Many theories have been advanced to account for these objective noises. Wieden believed them to be due to a clonic spasm of the stapedius. A number of observers attributed them to spasm voluntary or involuntary, of the tensor tympani. Politzer, Lushka, and others believe them to be due to spasm of the palatine muscles, whereby the anterior wall of the mouth of the Eustachian tube is suddenly drawn away from the posterior, and the noise thus produced. This last view is generally received as sufficient to explain the cause of the peculiar snapping noise in most cases.

Any one interested in this subject will find a chapter devoted to objective noises in the ear in the last edition of Charles H. Burnett's work on the ear, containing the history of several cases coming under his observation and others; together with a complete reference to the literature of the subject.

AN IMPROVED FORM OF EUSTACHIAN CATHETER.

By H. LINDO FERGUSON, F.R.C.S.J., DUNEDIN, N. Z.

IN order to overcome the difficulty of passing an Eustachian catheter in cases where the inferior turbinated bone or a displaced septum encroach on the nasal passage, and to avoid giving pain to the patient when the nasal mucous membrane is much swollen and sensitive, it occurred to me that a soft-rubber catheter might be used, fitted with a straight style, on withdrawal of which the catheter would resume its curve. My idea has been very carefully carried out by Messrs. Tiemann, and the instrument has given very satisfactory results so far as I have yet been able to try it. The catheter is of the ordinary shape, and is of soft red rubber, having inside the stem, and extending nearly to the point, a spiral of fine wire, which prevents the lumen of the instrument being lessened by pressure when in position. There is a straight style of the same length as the catheter, which, when it is introduced, obliterates the curve at the beak. The catheter on the style is introduced like a straight probe along the floor of the nostril, with the side to which the beak tends to curve outward. When the back of the pharynx is felt, the style is withdrawn, and the beak curls round to the mouth of the Eustachian tube. In several cases I have not had to draw it forward at all, for the curve of the beak withdraws the point about the right distance. The instrument passes through very much obstructed nostrils, and gives no pain in cases in which the hard-rubber catheter cannot be tolerated.

**TWO CASES OF DEAFNESS FROM CEREBRO-SPINAL
MENINGITIS, THE ONE ONE-SIDED, THE OTHER
DOUBLE-SIDED WITH SIMULTANEOUS AFFECTION
OF BOTH EYES, ENDING IN RECOVERY IN ONE.**

By H. KNAPP.

AS the question of deafness from cerebro-spinal meningitis is still greatly debated, and as I do not know whether I shall soon have the time to prepare for publication a rather extensive incident clinical material, bearing on this question, that has come under my observation, I select two cases which may perhaps not be read without interest on account of some unusual and suggestive features which they present.

CASE I.—One-sided Deafness from Cerebro-Spinal Meningitis.

May 21, 1877, a twelve-year-old, well-developed, and healthy girl, the daughter of healthy parents, C. H. L., of this city, was brought to my office on account of deafness in the right ear. On examination I found that the child had suffered from cerebro-spinal meningitis when two years old. The disease began with a loud scream at ten o'clock in the morning. Then she suffered a great deal for two weeks, rolling her eyes, had opisthotonus for eleven days, general convulsions off and on, and a high fever. She was very sick for five or six weeks, and exceedingly weak for two months longer. Then she gradually recovered. The defect in hearing was accidentally discovered when she was six years old, the child having had no other illness than the one just described. I found both tympanic membranes normal, the tubes open, pharynx healthy. The watch was not heard on the right side, either when pressed on the auricle or the bones around.

The hearing on the left side was not quite of normal acuteness, namely, $h \frac{1}{2}$, $v \frac{1}{5}$. Bone-conduction good. The tuning-fork heard only on the left side. When the left ear was held closed and the right turned toward me, she understood ordinary conversation at the distance of several feet. The tuning-fork passed up and down was heard in puffs before the left ear, the same but much feebler before the right.

Six years later, in May, 1883, I examined her again, and found exactly the same condition.

REMARKS.

This is the only case of one-sided deafness from cerebro-spinal meningitis which at this moment I recall from my own practice.

There can be little doubt that the disease of which the child had suffered when she was two years old was cerebro-spinal meningitis, for the symptoms were characteristic enough, her physician had diagnosticated it as such, and cerebro-spinal meningitis had been epidemic in New York at that time.

The causation of the deafness may, with a probability which approaches certainty, be ascribed to that disease, as the child had not been ill later, and in the pharynx, the E. tubes, and the middle ear no alterations were discernible that might have produced the deafness.

The deafness, it seems, was not complete, as the tuning-fork was heard in puffs, though feebly, when passed up and down the right ear. People totally deaf in one ear hear a tuning-fork which is moved up and down the deaf side, with the healthy ear, but evenly, not with rhythmical reinforcements.

I consider it most likely that during the meningitis both ears were affected, with total or almost total loss of hearing in the right, and only little damage in the left. Cerebro-spinal meningitis is generally regarded as an infectious disease. The visual and auditory organs may be affected by it in two ways: First, by *propagation of the inflammation along the optic and acoustic nerves*, which, for the eye at least, is the rarer way; or secondly, by *metastatic inflammation* of the interior of the eye and ear. For the eye both ways are proven by ophthalmoscopic and microscopic examinations. For the

ear the evidence is not so incontrovertible, but it seems to me sufficiently strong to be accepted by every unprejudiced observer.

In connection with the case under consideration, I want to bring out one point which is of great practical importance, namely, that *metastatic inflammation of the interior of the eye and ear does not, in all cases, destroy the function of the visual and auditory organs*. With regard to the eye, this proposition is supported by an unambiguous case, which I published in the "Transactions of the American Ophthalmological Society," 1882, volume iii., page 396.

Metritis from exposure during menstruation was followed by metastatic irido-choroiditis in both eyes; one eye recovered completely, in the other the disease ran its usual course, ending in phthisis bulbi.

In further support of the above proposition I will relate another case, which will serve, at the same time, to explain by analogy, the occurrence of the deafness in the case under consideration.

CASE 2.—Bilateral Deafness and Mono-lateral Blindness from Cerebro-spinal Meningitis; the other Eye, Affected also, Recovered.

Jan. 4, '83, the six-year-old son of J. J., of this city, was brought to me with the following notes from his family physician, Dr. J. Dwyer, of New York: "The little patient, J., was attacked last March with an aggravated form of cerebro-spinal meningitis, and barely escaped with his life. Vision in his right eye was lost early, and I presume his hearing also; but as he was insensible for months, we could not judge of his hearing at that time. He was for three consecutive days in a state of general clonic eclampsia, and remained hemiplegic for months. He has had pretty active treatment,—bromides, quinine, chloral, arsenic, and strychnia, with electricity. His general health has very much improved lately, but there is no improvement in his sight, and his hearing, I fear, is completely lost."

From the parents and on examination of the patient, I learned the following: Ten months ago the boy, after ailing for some weeks, awoke at two o'clock in the morning with a sudden shock, cried violently, and successively had convulsions, opisthotonus, headache, vomiting, loss of consciousness; he became pale and

reduced to a skeleton ; was in bed six months, had bed-sores. He became deaf on the eighth day ; the right eye was affected at the same time, bloodshot, swollen, with matter in the interior. The left eye was likewise inflamed, fluctuating between better and worse for a few weeks, then got well. The right remained blind. While recovering he was excessively weak, his gait was staggering, and is still unsteady.

At present the left eye is normal in structure and sight ; in particular the optic disc and choroid show no changes. The right is a little smaller than its fellow, and its tension is diminished (T.—1). The iris and lens are pushed toward the cornea ; the periphery of the iris is not retracted. The pupil is irregular, small ; the lens opaque. There is, in this eye, faint but distinct perception of light.

The physical examination of both ears shows no abnormality. The deafness is absolute for all sources of sound.

REMARKS.

We see in this case again that the general disease affected both ears and both eyes, destroyed the hearing on both sides, reduced the vision in one eye to faint perception of light, whereas in the other it was completely restored. This case, and very many similar ones, could not, by any manner of means, be explained according to the theory of Voltolini by an otitis intima. The nature of the ear-disease may be left to conjecture, but that of the eye-disease is plainly a purulent uveitis, which, as all know, is either traumatic or metastatic. No kind of otitis interna is known to produce metastatic choroiditis, or any thing like the picture of the disease presented by the case under consideration. The remarkable feature of this case, however, is that both eyes were inflamed and one recovered its sight. This for the eye is not unknown, and there are cases on record (Moos and others) that deafness from cerebro-spinal meningitis is not always total. If, by way of analogy, we assume that the ear-disease is purulent (metastatic) otitis interna, it certainly—like purulent uveitis—is an exceedingly destructive affection, yet there may be a certain number of cases in which recovery takes place before the inflammation has reached such a degree of intensity as permanently to destroy the function of hearing.

REPORT ON THE PROGRESS OF OTOLOGY DURING THE FIRST HALF OF THE YEAR 1884.

Translated by Drs. R. C. BRANDEIS, New York, and C. J. KIPP, Newark, N. J.

I.—NORMAL AND PATHOLOGICAL ANATOMY AND HISTIOLOGY OF THE EAR.

BY H. STEINBRÜGGE, OF HEIDELBERG.

1. Prof. PAUL ALBRECHT, Brussels. On the morphological importance of the mandibular articulation, of the cartilage of Meckel, and the ossicles of the ear, with an attempt to prove that the scale-like part of the temporal bone of mammals is primarily composed of a squamous and a quadratous portion. Brussels, 1884.

2. Dr. EUGENE FRÄNKEL, Hamburg. On the effect of blunt force upon the external ear, with special consideration of the development of othæmatomata. *Virchow's Archiv.*, vol. xcv., 1884.

3. Dr. A. EITELBERG. Results obtained from the measurements of the weight of the human ossicula auditus. *Monatsschr. für Ohrenheilk.*, 1884, No. 5.

1. The author premises that the maxillary articulation, from the gnathostomata upward to the mammalia, is considered as a connection between the articulare and the quadratum; that in mammals, on the contrary, anatomists look upon it as uniting the lower jaw with the squamous portion of the temporal bone; with this difference, however, that Gegenbaur, Kölliker, and Wiedersheim do not, as Huxley does, consider the lower maxilla of mammals homologous with the mandible of the lower

vertebrata, but as corresponding to the dental. ALBRECHT then reviews the opinions of the different authors in respect to the origin of the ossicles of the ear from the first and second branchial arches, or from the walls of the labyrinth, and then elaborates his theory that these ossicles are analogous to the former columella ; and that this corresponds to the maxillary ligament of fishes. He then criticises the views advanced by Gegenbaur, Kölliker, and Wiedersheim, that the maxillary articulation of the non-mammalian gnathostomata must be analogous to the malleo-incudal joint of the mammalia. Albrecht has never been able to adopt this theory ; as a gradual phylogenetic transition of these organs, anatomical or functional, cannot be imagined. He considers the maxillary articulation of mammals not only as analogous to those of the lower vertebrata, but even goes so far as to assert that the temporal bone of mammals is composed of the squamosum and the quadratum ; the maxillary joint representing here also an *articulatio quadrato-articularis*. This assertion is based upon a specimen of the temporal bone taken from a child which was born with a hare-lip and a double cleft palate. The right squamous bone was normal, but on the left side the zygoma, or, as Albrecht prefers to term it, the quadratum, remained separated from the real squamous portion. In this case, as in several others quoted by the author, (Meckel, Gruber, Ranke), there was a suture between the two primary elements of the temporal bone, the squamosum and quadratum, which suture Albrecht has also demonstrated upon several monkey skulls. A drawing of the specimen is appended.

2. In order to settle the still open question of the seat and the genesis of othæmatomatous tumors, FRÄNKEL made some experiments upon rabbits of different ages. The auricles of the anæsthetized animals were either subjected to firm pressure between the fingers or struck with a hammer, which invariably caused a bloody tumor. Neither the ages of the animals nor the right or left side, made any difference in the achievement of the desired results. Other experiments were made for the production of abnormalities of the cartilage of the auricle by means of punctures, injections of tincture of iodine, and inunctions of croton oil. The indurations thus caused appeared to facilitate rather than retard the hemorrhagic effusions. But it could not be determined whether maceration or the development of new blood-vessels favored these extravasations. When the swelling begins to form, the first thing noticed is an engorgement of the vessels and an increase of tem-

perature ; next come isolated extravasations, which run together ; and then we find fluctuating, bluish-red ridges, which are more frequent on the inner than on the outer side, and which, later on, may increase considerably in size. The cutis covering these tumors invariably remains unaffected. The further progress of the disease is as follows : Under expectant treatment the swelling gradually subsides, the color becomes less intense, and in the course of two or three weeks the tumor disappears, leaving either a circumscribed or a diffuse thickening behind. Absorption takes place, either with a disintegration of the red blood-corpuscles or by their being assimilated by the larger cells, which is followed by a transformation into pigment. He never found any cartilage cells in the fluid. In respect to the seat of the tumor, Fränkel says that the extravasation is only occasionally found between the cartilage and the perichondrium. He never found any cavities in the cartilage, while the skin was often lifted off in bladder-like swellings by the effusion. The microscopic examination of these parts after they were hardened in absolute alcohol showed that the process of disease was limited to the subcutaneous cellular tissue and perichondrium, or had extended to the cartilage. The perichondrium, in fact, showed ribbon-like hemorrhagic infiltrations, which may be absorbed without leaving a deposit of pigment. In other parts there was inflammatory irritation, which was manifested by a great development of cartilage cells—this being the cause of the ultimate deformity of the auricle. The cartilage itself almost invariably showed numerous perpendicular solutions of continuity, which involved also the perichondrium. This, as well as the adjoining subcutaneous cellular tissue, becomes entangled in the clefts of the cartilage, and is soon permeated by new cartilage cells and connective-tissue corpuscles. The old cartilage cells, which border on the line of fracture, do not proliferate but degenerate, and a fibrous tissue is deposited in their place. Fränkel sides with Guddens and the other writers who do not believe that an othæmatoma can develop without previous traumatism. In regard to the difference of time that must elapse between cause and effect, he calls attention to the fact, so important in a forensic sense, that twenty-four hours and more may intervene before the swelling appears. The site of the extravasation is either between the skin and the perichondrium or more rarely between the latter and the cartilage.

In respect to treatment, the author proceeded, as follows: He took a rabbit which had othæmatomata on both ears, and treated the one side expectantly and the other by operative means, without noting any difference in the duration of the reparative process. He therefore prefers the former plan, the more so as in the majority of cases there is a simple fracture of the cartilage, which may be transformed into a compound one in case any injury is done to the integument.

3. EITELBERG undertook to determine the weight of the auditory ossicles, which he removed from thirty different subjects, varying in sex and age (these ranged from embryos of the seventh and eighth months to senility). The results which he obtained were as follows: the weight of the malleus has reached its maximum as early as the sixth year of life, then varying from 0.022 to 0.024 *grm.* At this time of life the weight of the incus averages 0.025, and exceeds that of the malleus of the same side by 0.004 *grm.* The weight of the stapes averages 0.002—which is already at its maximum as early as the eighth month of foetal life. The increase in weight of the malleus and incus continues even later than this, although, according to Urbantschitsch, they reach their greatest size very early in life. Eitelberg also found that the quantity of water contained in the hammer and anvil in later months of foetal life and early in infantile life averages 0.006 *grm.*, while that of the stirrup amounts to 0.001 *grm.* In the adult the malleus averages 0.004 *grm.*, the incus 0.003 *grm.*, and the stapes again 0.001 *grm.* of water. In later life, therefore, the solid constituents increase while the fluid grow less. There appears to be no difference in weight in the two sexes, nor was there any notable difference in the right or the left side, with one exception. This last assertion is the more striking, because in twenty cases examined by Urbantschitsch, only five instances were noted in which the length of the malleus was the same on both sides; this would lead one to infer that there might be an inequality in weight also.

II.—PATHOLOGY AND THERAPEUTICS OF THE EAR.

By A. HARTMANN, BERLIN.

GENERAL.

1. Dr. TRUCKENBROD. Statistical report of the aural polyclinic of the University of Würzburg. *Arch. f. Ohrenh.*, vol. xx., p. 255.

2. Dr. STACKE. Statistical report of the cases treated in the polyclinic for diseases of the ear at Halle from Oct. 15, 1882, to Oct. 15, 1883. *Ibid.*, vol. xx., p. 267.
3. Report of the department of diseases of the ear of the military hospital at Munich. *Münchener ärztl. Intelligenzblatt*, Nos. 13, 14, 15, 1884.
4. Prof. A. BURCKHARDT-MERIAN, Basle. On the prevention of injuries to the organ of hearing by the noise of railway trains. *Correspondenzbl. f. Schweizer Ärzte*, 1884.
5. Prof. BURCKHARDT-MERIAN. On the injury to the hearing caused by the noise of the railway. *Ibidem*.
6. Dr. FRIEDRICH BEZOLD, Munich. On the affections of the ear in typhoid fever. *Archiv für Ohrenheilk.*, vol. xxi., p. 1.
7. Dr. SCHWABACH, Berlin. On the permanent lesions of the ear caused by the internal administration of quinine and salicylic acid. *Deutsch. med. Wochenschr.*, No. 11, 1884.
8. Prof. BERTHOLD, Königsberg. On autophony. (Communication to the French Otological Association.) *Revue mens. de laryngol.*, etc. No. 4, 1884.
9. Dr. BRUNSCHWIG. The scotoma of audition. *Ibid.*, No. 2, 1884.
10. Prof. ADAM POLITZER. A new small instrument for the improvement of hearing. *Wiener med. Wochenschr.*, No. 22, 1884.
11. A. KOREN. The diseases of the ear in scarlet-fever. *Magazin for Lägeridenskap*, vol. xii., page 773.
12. Dr. LADREIT DE LACHARRIÈRE. On deaf-mutism. *Annal. des mal. de l'oreille*, etc., Nos. 1 and 2, 1884.

1 and 2. In the Würzburg clinic 282 patients were examined and treated in the course of two years. A few histories of cases are appended which correspond to the paucity of the material under observation.

STACKE's report of the work done at the clinic at Halle is more valuable. The diagnosis made in a very interesting case of tubercular myringitis could not be confirmed histologically as the patient failed to report himself again. After several futile attempts to remove a small pebble from the auditory meatus, by a physician not connected with the clinic, total facial paralysis set in. On examination no foreign body could be found. There were six

fatal cases, in all of which perforation of the mastoid process had been made. The histories of these cases are given. During the year 600 new cases were treated, suffering from 690 different affections; 181 operations were performed.

3. During the year reported 319 cases of ear-disease were treated in the military hospital at Munich.

4 and 5. The Medical Society of Winterthur petitioned the Federal Railway Department either to replace the steam whistles with some emitting less shrill tones, or to lower their pitch, and not allow them to be opened in the vicinity of the stations, and that signals to be given be lower, shorter, and not so frequent. At the same time BURCKHARDT-MERIAN was requested to investigate the matter. On certain roads the request was complied with; but as the nuisance was not abated on others, B.-M. forwarded a memorial, in the form of a New Year's greeting to the medical superintendent of the Swiss railway system, in which he depicted, in glowing colors, that these steam whistles were annoying; that, in many cases, they were hurtful to the ear, especially to the perception of higher tones; and that, moreover, as has been demonstrated in America, railway traffic need not suffer even though they be entirely done away with.

In his second paper Burckhardt-Merian quotes the reply of Dr. Deucher, the medical official referred to above, who argues in favor of the utility of the steam whistle (although his arguments are not thoroughly convincing), but grants the wishes of the Society of Winterthur, and has also taken the necessary steps to enforce the new regulation. The author again requests that the whistle be used as little as possible; as it may be replaced by bells. If this is not possible he suggests that they be attuned a few octaves lower.

6. As far as the clinical part of BEZOLD's paper is concerned, he, as did Schwartz, recognizes three different affections of the ear as arising in the course of typhoid fever: 1, deafness, without any noticeable evidences of inflammation, which appears to be due to central disturbances; 2, obstruction of the Eustachian tube with the usual consequences; 3, purulent middle-ear disease with or without perforation of the drumhead.

In some cases the affection of the acoustic nerve appears during the first few days of the disease. Obstruction of the Eustachian tube was only observed once in fifty cases of disease of the ear. Acute otitis media was noted in four per cent. of all the cases of

typhoid, but did not set in before all the constitutional symptoms had subsided, generally between the twenty-fifth and thirty-fifth day of the disease. The course run by the acute otitis is given in detail. The inflammatory symptoms are generally quite intense, and the mastoid process is frequently and markedly affected. The perforation of the drumhead is generally found in the posterior half of the membrane. Bezold believes that the acute otitis media may be due : first, to an extension of the inflammation from the naso-pharynx ; secondly, to the propagation of septic matter from the naso-pharynx into the tympanum ; thirdly, by embolism of the vessels ramifying in the mucous membrane of the middle ear, either due to endocarditis and thrombi from the left ventricle, or to peripheric purulent foci.

7. SCHWABACH reports two cases which go to show that, in some instances even moderate doses of quinine and salicylic acid may be followed by permanent disturbances. On the other hand, even very intense and chronic deafness and subjective noises may be amenable to treatment. The benefit derived, in the first case, from treatment, and the fact that the vertigo and the subjective noises increased during damp, raw weather, lead Schwabach to believe that this was an affection of the middle ear complicated with an increase of pressure of the stapes upon the intralabyrinthine fluids. In the second case (after the administration of only three doses, one gramme each, of the salicylate of soda) the subjective noises remained even after the hearing was restored ; and this leads him to conclude that there must have been a permanent irritation of the acoustic nerve.

8. BERTHOLD carefully considers the pathology and therapeutics of autophony. In endeavoring to explain the cause of this phenomenon, he arrives at the conclusion that it is due to the fact that, of the four factors which ordinarily regulate, *i. e.*, lessen or suspend, the vibrations and resonance of the drumhead, when the tube is patent, the first three are impaired in their action, and even the fourth cannot exercise its function. These four factors are : first, the confinement of air ; second, the tension of the drumhead by the ossicles ; third, the incompressibility of the labyrinthine fluids ; and fourth, relaxation of the tensor tympani and contraction of its antagonist, the stapedius muscle. Appended hereto are reports of cases and clinical observations of other authors.

9. BRUNSCHWIG found in the case of a young man who at-

tended Baratoux's clinic for the relief of deafness, and whose drum-heads on both sides showed the characteristic symptoms of a healed otorrhœa, that he could hear the watch, on the right ear, at a distance of from 20 to 16 *cm.*, but did not hear it at a distance of from 16 to 13 *cm.*, but from this distance to actual contact he was able to hear it distinctly. Further tests afforded similar results. This unusual phenomenon, which he failed to observe again in this patient or in any other case, he considers analogous to the defects in the visual field, and calls it scotoma of audition, and hopes some attention will be paid to the subject.

10. The results which POLITZER obtained from the little instrument previously recommended by him were not entirely satisfactory. He has therefore devised a new one, which has answered very well in a large number of cases which failed to be relieved by any other therapeutic device. By means of this new instrument the vibrations of the cartilage of the auricle are directly transmitted to the membrana tympani by means of an elastic conductor. Politzer accepts it as an undoubted fact that the elastic cartilage favors the transmission of sound-waves to the bones of the head. In order to connect the drumhead with the concha, a very small drainage-tube, whose inner end, by being split open, formed a narrow disc, was found most serviceable. The outer end of the tube is connected with a caoutchouc membrane, from 1 to 1.25 *cm.* in diameter, which is inserted into the concavity of the concha. This instrument can be inserted by the patient himself. It affords relief not only by facilitating the transmission of sound, but also by the pressure which it exerts. Improvement of hearing was noted in all cases of disease of the middle ear, in which disturbances of the conduction of sound in the tympanum were the cause of deafness.

11. KOREN tabulates 426 cases of scarlet-fever, and appends remarks on the statistics of deaf-mutism in Norway. He lays stress on the following: otitis externa arises when the exanthem extends to the meatus, in the same manner in which it develops in erysipelas. This affection never manifests itself spontaneously. In forty-five cases (10.56 %) there was otitis media, which Koren attributes solely to extension of the scarlatinal angina through the Eustachian tube. One case of otitis interna is reported: a girl aged seven years, who became totally and permanently deaf during the first days of her illness.

12. LADREIT DE LACHARRIÈRE gives us a general review of

the diffusion, etiology, and pathological anatomy of deaf-mutism. He believes that acquired deaf-mutism is more frequently found in France than the official reports would lead one to believe. Among one hundred cases he found only twenty-one which were congenital. It seems that he arrived at this conclusion by excluding from the category of congenital deaf-mutes all those cases in which he found pathological changes in the drumhead. The different diseases which may cause deaf-mutism are carefully described. In the second part of his article he describes the mode of instruction employed in France, its development at the time of the Abé de l'Epée, and the changes that have taken place since the introduction of the German method, as recommended by the Congress at Milan. Since 1880 new pupils are separated from old ones and are taught articulate language.

EXTERNAL EAR.

13. Dr. STETTER, Königsberg. On the operative removal of congenital malformations of the auricle. *Arch. f. Ohrenheilk.*, vol. xxi. page 92.

14. Dr. HESSLER, Halle. Gumma of the auricle. *Ibid.*, vol. xx., pag. 242.

15. Prof. Moos, Heidelberg. A case of neuralgia, most marked in the second branch of the fifth nerve, due to an exostosis in the external auditory meatus. *Berlin. klin. Wochenschr.*, No. 8, 1884.

16. J. NICOLAYSEN. Foreign body in the cavity of the tympanum; resection of the annulus tympanicus. *Norsk Magazin for Lægeridenskab*, vol. xii., pag. 799.

17. DESMOULIN. A case of rupture of the drumhead from a box on the ear. *Gaz. méd.*, 1884 pag. 222.

13. The deformity operated on by STETTER, was due to a folding of the auricle, from above and behind, downward and forward, over the external auditory meatus. The operation resulted in a permanent exposure of the meatus and an improved shape of the auricle.

14. After great swelling of the auricle, a lardaceous ulcer made its appearance. By means of antiphlogistic treatment HESSLER succeeded in bringing about a temporary improvement. Later, the cartilage was exposed, and, chloroform being administered, a piece about the size of a dime was removed. Other operations were also necessary, but when a gumma made its appearance on the tibia iodide of potassium was administered and the disease of the auricle was cured.

15. Moos' paper is a reprint of an address delivered in the Otological Section at the Congress of Naturalists and Physicians, held at Freiburg (see report, vol. xiii).

16. NICOLAYSEN removed a small pebble from the middle ear by resecting the annulus tympanicus with saw and chisel.

17. The case described by DESMOULIN is a rupture of the membrana tympani in consequence of violent compression of the air in the meatus due to a box on the ear. Immediately after the blow the patient felt violent pain in the ear and head and shortly after a purulent otitis media set in, which persisted for six weeks, while the loss of hearing and a large perforation of the drumhead became permanent. Singular to say, in the entire report, which enters minutely into all possible details, there is not a word said about the condition of the drumhead; the existence of a perforation is inferred from the sound made by the air passing through the ruptured drumhead and the fact that the current is felt at the meatus when Valsalva's method is employed (!).

MIDDLE EAR.

17 a. MÉNIÈRE. De la dilatation intermittente et progressive de la Trompe d'Eustache. (On the intermittent and progressive dilatation of the Eustachian tube.) *France méd.*, p. 129, 1884.

18. Dr. BARATOUX. De l'électrolyse ou de la galvano-caustique chimique de la trompe d'Eustache. On the electrolysis or chemical galvano-caustic treatment of the Eustachian tube. *Revue mens. de laryng., etc.*, No. 6, 1884.

19. Prof. VOLTOLINI. On the catheterization of the Eustachian tube in cases of palatum fissum, and on the inspection of the nasal cavity from in front while it is illuminated from behind. *Monatsschrift f. Ohrenheilk.*, No. 1, 1884.

20. VICTOR LANGE. Bedrag til Laeren om der acute suppurative Betaendelse i Mellemøret. Contribution to the doctrine of the acute purulent inflammation of the middle ear. Copenhagen, 1884.

21. Dr. K. BÜRKNER. The treatment of otorrhœa. *Berliner klin. Wochenschrift*, No. 1, 1884.

22. Dr. HESSLER, of Halle. Pyæmia from acute suppuration of the middle ear. *Archiv f. Ohrenheilk.* vol. xx., p. 223.

23. Prof. GRUBER, Vienna. The pathogenesis of inflammations in the region of the parotid gland and the lateral wall of the pharynx. *Wiener allgem. med. Zeitung*, No. 6, 1884.

24. Dr. WILHELM KOSEGARTEN, of Kiel. On an artificial improvement of hearing in cases with large perforation of the drum membrane. A treatise for the attainment of the *venia legendi* for otology. Kiel, 1884.

25. O. WANSCHER. Nogle Tilfælde af Resektion, etc. Some cases of resection of the mastoid process with remarks as to method and indication. *Hospitals-Tidende*, January 23 and 30, 1884.

26. Dr. JACOBY, of Breslau. On the operative treatment of caries of the temporal bone. Sixteen cases. *Archiv f. Ohrenheilk.*, vol. xxi., p. 54.

27. Prof. VOLTOLINI. On tubercle-bacilli in the ear. *Monatschrift f. Ohrenheilk.*, No. 2, 1884.

28. Dr. L. KATZ, of Berlin. On croupous inflammation of the middle ear in scarlet-fever. *Berliner klin. Wochenschrift*, 1884.

29. AUGUST LUCÆ. A method of mechanical treatment of chronic disturbances of mobility in the sound-conducting apparatus of the organ of hearing. *Archiv f. Ohrenheilk.*, vol. xxi., p. 84.

17a. MÉNIÈRE praises bougieing of the tubes, which he has practised successfully for fifteen years. He describes his method, which differs from the one usually employed in this, that instead of withdrawing the bougie, he causes it to slide out of itself by bending forward the patient's head. This is to be done five to twenty minutes after its introduction. In appropriate cases the bougies may be coated with medicinal substances.

18. BARATOUX, in the introduction, mentions the attempts previously made to employ electrolysis in the treatment of contractions of the Eustachian tube. He uses a hard-rubber catheter having in its enlarged end a hole through which an electrode of silver or platina is introduced. The electrode may have at its end an olive or a triangular loop. The second electrode is placed on the mastoid process. The strength of the current must not exceed five milliamperes, and the application should not last more than four to five minutes. In this way an eschar is formed which leaves a thin cicatrix. Baratoux uses the electrolysis or the chemical galvano-cautery, as he calls it, only in cases which have resisted the other methods of treatment. Baratoux's method of making perforations in the drum membrane and keeping them open will require further confirmation.

19. In one of VOLTOLINI's patients, who was afflicted with hardness of hearing and otorrhœa, and a cleft of both the hard

and the soft palate, the posterior lip of the tube, but not its mouth, could be seen when the patient's head was thrown far backward. As in consequence of this abnormality Politzer's method succeeded only partly, or not at all, it became necessary to resort to catheterization, which could be accomplished only under illumination. With an instrument with a long beak the tube could, however, be reached also from the mouth. (In cases of cleft palate catheterization can be accomplished with certainty and without difficulty under illumination from the mouth with a catheter which has been bent into the form of an S.—REVIEWER.) In this connection Voltolini describes a method of examining the nose, which can be carried out sometimes also in normally built individuals by the aid of an assistant. A spring speculum is placed in the anterior opening of the nose, and a rhinoscopic mirror illuminated by a reflector in the pharynx. It is said that this method enables one to form easily an opinion of the thickness of the structures. In this Voltolini is in error, as the more or less complete transparency of the structures depends less on their thickness than on their character.

20. The very complete description of the acute inflammation of the middle ear given in LANGE's monograph is based on the literature on the subject as well as on his own experience.

21. BÜRKNER states that he has employed a solution of corrosive sublimate in the treatment of middle-ear suppuration and has found it useful. In his opinion it is not, however, preferable in general to boric acid and nitrate of silver. In some cases brilliant results were obtained from it after long-continued but unsuccessful treatment with boric acid and nitrate of silver.

22. HESSLER describes a case of pure pyæmia supervening on acute inflammation of the middle ear. A relapse of the inflammation with bulging of the drum membrane caused the author to abstract blood by leeches and to make an extensive paracentesis. Shortly afterward the patient complained of fever, and the temperature rose to 40° (104° F.). No rigors and no fever delirium. There were no marked inflammatory symptoms about the ear itself. The secretion was of a greenish color and offensive only for a short time. The subsidence of the fever was rapidly followed by complete recovery. Hessler thinks that an infection through the incision in the drum membrane can be excluded. He believes that the absorption of phlogogenic purulent matter resulted from the reduction of tension in the blood-vessels, which

followed the abstraction of blood from the infra-auricular region. As a consequence, purulent thrombi were drawn from suppurating veins into the general circulation.

23. GRUBER points out that the fissura Glaseri and the clefts and defects in its continuation in the temporal bone connect anatomically the middle ear with the parotid gland and the lateral wall of the pharynx. This explains why at times inflammations of the middle ear extend *ex contiguo* to the parotid region without the participation of the external canal in the disease, or, as in mumps, the inflammation travels to the middle ear. Gruber has also seen cases in which the inflammation crept from the mastoid process to the parotid region without involving the external canal. Frequently the fissura Glaseri is not completely limited upward and outward by the union of the upper margin of the annulus tympanicus with the outer plates of the horizontal squamous portion, and in such cases the inflammation may extend above into the groove under the ascending ramus of the inferior maxillary bone and below to the lateral wall of the pharynx.

24. KOSEGARTEN has frequently insufflated powdered alum in cases with large perforations, but with little secretion, and has observed that this treatment is often followed not only by a cessation of the discharge, but also by a marked improvement in hearing. The powder forms a disc which acts as an artificial membrane. The disc may remain intact for many months. Kosegarten made various experiments to ascertain the cause of the improvement in hearing. The improvement followed the application of various powders, and also the injection of ether, after its evaporation. If iodoform were added to the ether a still greater improvement was produced by the layer of this substance, which remained after the ether had evaporated. Other irritants, such as water injections, the interrupted current, and the sound of a bell also produced an improvement in hearing, so that it must be assumed that these irritants increase the functional activity of the nervous apparatus. Artificial hardness of hearing he could produce by closing the external canal for a long period; this impairment of hearing was, however, relieved at once by the application of a strong acoustic irritant (the bell).

25. WANSCHER describes two resections of the mastoid process, made by himself.

1. A student, twenty-two years of age. For six months, hardness of hearing and pain deep in the right ear. No subjective noises.

Fever at times. Membrana tympani slightly reddened, otherwise normal. Eustachian tube and middle ear the same. In the mastoid region there is a gland the size of a pea. An incision was made through the skin and the gland enucleated. It proved to be unmistakably tuberculous. Four days later resection of the mastoid process; long incision through the skin and removal of the outer wall by the gouge. About $\frac{1}{2}$ cm. below the outer surface a mass of tuberculous granulations was found, which was removed with the sharp spoon. Corrosive sublimate and iodoform were used in the after-treatment. Cure in six to eight weeks. No pain after hearing was restored.

2. A soldier, twenty-three years old; previously healthy. Two months after the sudden occurrence of an affection of the left middle ear, he had exceedingly severe pain in the left half of the head; at the same time an extensive œdema in the left temporal region appeared with impairment of vision, which, it is alleged, gradually increased to total blindness; no strabismus, no diplopia, and no exophthalmos. Normal reaction of the pupils and absolutely normal fundus oculi. Profuse otorrhœa; some swelling of mastoid region. A considerable quantity of pus was evacuated by the operation. The mastoid cells were filled with a mass of soft granulations, which were in part scraped out with the sharp spoon. After the operation: good health, absence of headache, restoration of sight. On the day after the operation erysipelas developed, which lasted for six days, and gave rise to an abscess under the temporal muscle. The abscess was evacuated by an incision. Fourteen days after the operation the patient was out of his bed.

Both operations were made under ether. The first case was diagnosed by the author a tuberculous mastoiditis, and the result showed that the diagnosis was correct. In the second case the diagnosis was self-evident. The disturbance of vision the author considers a reflex amblyopia. In his remarks on these cases the author gives a short historical review of the operation, refers to the dangers of the same, and mentions the anatomical observations of Bezold, Hartmann, and others. He also emphasizes his method of operation: the removal of layer after layer of the outer wall of the mastoid by means of the gouge. In his critical remarks on the utility of the operation he lays great stress upon the revulsive method, and closes with the suggestion that all persons suffering from chronic otorrhœa should be made acquainted with the dan-

gers attending an expectant (?) treatment, and the chances of an operation (resection) be pointed out to them. (Victor Bremer, REVIEWER).

26. JACOBY reports the histories of 19 cases of caries of the temporal bone in which he performed surgical operations; 14 of the cases recovered, 5 died. In most of the cases the operative procedure consisted in making an opening in the mastoid process by means of the chisel; in one case he made a paracentesis of the drum membrane and in another he destroyed a polypus with the galvano-cautery. No general conclusions are drawn from the observed cases by the author.

27. VOLTOLINI reports on tubercle-bacilli in the ear. In his first paper he dwells on the prognostic connection between suppuration of the ear and latent or apparently improving phthisis of the lungs, to which he has called attention for a long time. In the secretion removed with all possible precaution from the ear of one of these cases he found tubercle-bacilli. The great diagnostic value of the bacilli is thus proved. In the second paper he describes at length the method of examination, but reserves a fuller account of his observations for some future occasion, when a larger number of cases have been examined. As the secretion of the ear glands is not easily stained and interferes with the examination, he first removes the secretion which has accumulated in the external canal, and then obtains some of the pus from the tympanic cavity on a small piece of sponge. This secretion is then examined according to the well-known method of Ehrlich-Rindfleisch with an immersion lens and Abbé's condensor. "This examination is often very difficult," and "such difficult examinations had better be left to the specialist." It is uncertain whether he means that only the specialist is able to examine dried preparations for bacilli (which seems improbable) or that only a specialist is likely to be the possessor of an oil immersion lens and an Abbé's condensor, for we cannot understand what other difficulty there can be that can be overcome only by a specialist.

28. KATZ reports a case of diphtheria of the middle ear, which occurred simultaneously with diphtheria of the pharynx during scarlet-fever. Death from nephritis. No autopsy.

29. As in the application of the air douche in diseases of the sound-conducting apparatus, the effect of the air pressure is chiefly dependent on the behavior of the drum membrane, which often is a hindrance to the action of a sufficient pressure on the ossicles,

LUCÆ determined to attack the ossicles themselves by instrumental means, through pressure on the short process. The instrument used for this purpose consists of a steel rod with a small hollow cone for the reception of the short process at the upper end, which rests in the handle upon a spiral spring. This spring pressure-probe is placed upon the short process, and then piston-like movements are made. A detailed statement of the experiments made will be published later. The results obtained by this treatment were as follows : no improvement, 7 ; good, 10 ; very good, 13.

NERVOUS APPARATUS.

30. Prof. MOOS, of Heidelberg. A case of partial labyrinthine affection after mumps. *Berliner klin. Wochenschrift*, No. 3, 1884.

31. Dr. KIRCHNER, of Würzburg. On cerebro-spinal meningitis, and its significance with regard to the organ of hearing. *Deutsche med. Wochenschrift*, No. 5, 1884.

32. Dr. HARDWICKE, of Sheffield. Épanchement sanguin, etc. Traumatic effusion of blood in the inner ear. *Annales des mal. de l'oreille etc*, No. 2, 1884.

30. MOOS adds to the long list of recently published cases of disturbances of hearing after parotitis, another observed by himself (his third). The peculiar feature of this case was that the patient, a boy thirteen years of age, had been totally deaf in the left ear, and almost deaf in his right ear for nine years ; the deafness followed some febrile affection ; his drum membranes were markedly changed. After the mumps, which affected both sides, he became also totally deaf in the right ear. Bone-conduction and the perception for low tones remained. No other symptoms were present. From this it seems probable that an exudation occurred in the labyrinth, whereby the functions of the greater part of the same were suspended. In opposition to the view which has heretofore prevailed, that a metastatic exudation caused the deafness, Moos directs attention to the explanation given by Lemoine and Lannois, who, by reason of the simultaneous occurrence of both affections, come to the conclusion that parotitis is an infectious general disease with co-ordinated local manifestations.

31. KIRCHNER, after some general remarks on this subject, describes a case of epidemic cerebro-spinal meningitis, in which a gradual increase of hardness of hearing occurred parallel with a

gradual change in the form of the disease from an acute to a chronic one, and an improvement in hearing in the course of healing. In this case as in three others which are briefly described, the remaining impairment of hearing was greater in one ear than in the other. Kirchner calls attention to the fact that the tympanic cavity also is often involved in these cases, and in conclusion recommends some therapeutic measures for the treatment of otorrhœa which present no novel features.

32. HARDWICKE describes the case of a young man, seventeen years of age, who, four days before he came under observation, had been struck by a cricket-ball on the right ear, which had been totally deaf since. The objective examination revealed no abnormality. The treatment consisted in leeches, blisters, and iodide of potassium. Complete restoration of hearing eight days later.

NOSE AND NASO-PHARYNGEAL CAVITY.

33. Dr. PAUL HEYMANN. The examination of the nose and the naso-pharyngeal cavity. *Deutsche Medicinal-Zeit.*, 1884.

34. Dr. HERING, in Warschau. De l'emploi de l'acide chromique, etc. On the use of chromic acid for cauterization in diseases of the nose, pharynx, and larynx. *Revue mens. de laryng.*, Nos. 5 and 6, 1884.

35. Dr. KIESSELBACH, in Erlangen. On spontaneous epistaxis. *Berliner klin. Wochenschrift*, No. 24, 1884.

36. Prof. SOMMERBRODT, in Breslau. Report of cures of pathological conditions, the result of reflex processes originating in the nose. *Berliner klin. Wochenschrift*, No. 10, 1884.

37. Dr. FRÄNKEL. Demonstration of a case of spasm of the facial nerve, cured by applications to the nose. *Deutsche med. Wochenschrift*, No. 25, 1884.

38. Dr. JACQUEMART. Amas considérable de concrétions calcaires, etc. Considerable deposit of chalky concretions in the nose. *Annales des. mal. de l'oreille*, etc., No 1, 1884.

39. W. BRÜGELMANN, in Inselbad. On the nature and treatment of ozæna. *Monatsschrift f. Ohrenheilk.*, No. 5, 1884.

40. Dr. THEODOR HERING, in Breslau. On pharyngomycosis leptothricia. *Zeitschrift f. klin. Med.*, Bd. vii., Heft. 4.

41. Dr. BENSCH, in Berlin. A new attachment of Voltolini's palate hook. *Monatsschrift f. Ohrenheilk.*, No. 5, 1884.

33. HEYMANN gives a complete description of the method of

examining the nose and naso-pharyngeal cavity, but offers nothing new. The paper is accompanied by a number of illustrations, mostly of antiquated nose specula.

34. HERING describes fully the application of chromic acid in the diseases of the nose, pharynx, and larynx. He believes that this remedy, which in his opinion is a most excellent one, is but rarely used, because it cannot be conveniently applied and the dose not strictly regulated, and because of fear of intoxication. Hering fuses the chromic acid upon the end of a silver probe or a glass rod, in the same way as is done with the nitrate of silver. Applied in this way to the mucous membrane of the mouth or the pharynx, the chromic acid causes but little pain. Hering has never seen symptoms of poisoning when it was used with proper precautions. The application of the acid is to be followed by rinsing of the parts with water, and gargling, and a solution of soda should be drunk if any of the acid has been swallowed. Hering has derived most benefit from chromic acid in cases of chronic nasal catarrh with swelling and moderate hypertrophy of the turbinated bones; here it surpassed all other remedies previously used. It brings about a rapid cure without causing severe pain.

35. KIESSELBACH confirms in his paper the statements made by the Reviewer some time ago with regard to the source of spontaneous bleeding from the nose. In most cases the source was found in the anterior lower region of the cartilaginous septum; more rarely the bleeding points were seen as far back as the upper margin of the septum cartilagineum; and in only one case further back than the anterior end of the middle turbinated bone, which in this case, however, extended uncommonly far forward. It is thus seen that in all of Kiesselbach's cases the hemorrhage came from the region of the cartilaginous septum, although in two of the cases it came also from the junction of the septum with the floor of the nose, in the vicinity of the foramen incisivum. The treatment pursued by Kiesselbach is the same as that recommended by the Reviewer some time ago, namely, the arrest of the hemorrhage at its source by cotton tampons, the chloride of iron, or the galvanic cautery.

36. SOMMERBRODT reports in detail a case in which there were present—in addition to the reflex phenomena of a vaso-dilatatory nature (œdema of the face and the conjunctiva) which have already been described by Hack, and are supposed to start from the erec-

tile structures in the nose,—paroxysms of sneezing, and profuse secretion from the nose and the tear-glands ; also reflex dilatation of the blood-vessels of the mucous membrane of the bronchi, presenting the picture of a chronic bronchitis ; also reflexes which caused vomiting ; and reflex phenomena of the nerves of the skin, such as chilliness, rigors, and blanching of the skin. The case was cured by the destruction of the erectile structures by the galvanic cautery. The same procedure he adopted in a case of functional phonic glottis spasm, depending on the same cause ; also in eleven cases of asthma, in two of which, however, according to the patients' statements, the affection was limited to the side of the chest corresponding to the affected nasal cavity. In a case of whooping-cough, Sommerbrodt brought about a typical paroxysm by cauterization of the turbinated bone ; subsequently this case was cured by further treatment of the nasal disease. Sommerbrodt always limits the cauterization to the surface.

37. FRÄNKEL showed to the members of the Berlin Medical Society a case of spasm of the facial nerve, which had been cured by applications to the nose. The spasm had been of four years' duration, and had been accompanied by pain in the nasal cavity of the same side. The introduction of a nasal speculum into the aperture of the nose brought on a severe attack of spasm, and touching of the nasal mucous membrane did the same. The spasm was cured by repeated applications of the galvanic cautery.

38. JACQUEMART'S patient suffered from occlusion of the left nose, a discharge from the same, and frequent epistaxis. The disease began in 1862. The examination revealed the presence in the nose of a dirty grayish body, which felt hard to the touch. Jacquemart thought that he was dealing with a carcinoma or an osteosarcoma. In the attempt to remove this mass piecemeal with the galvano-caustic loop, several solid fragments came away, which, as further examination showed, had formed about a fruit-seed.

39. Starting from the erroneous supposition that it is the almost general belief that ozæna is caused by a purely specific disease of the nasal mucous membrane, BRÜGELMANN gives his views of this disease. He believes that ozæna represents a suppuration of the turbinated bones and their covering, but that the peculiar odor is an attribute of the suppuration and not of the ozæna. In this view Brügelmann is in opposition to all authors

who are accustomed to examine the nose thoroughly in cases of ozæna. His treatment consists in the removal of the crusts with a solution of the chlorate of potassa. Tamponing of the nose is in his opinion a mistake (!).

40. HERING adds six new cases of his own to the eight cases of pharyngomycosis leptothricia already on record, and from these fourteen cases draws a picture of the disease. In this affection the tonsils and the base of the tongue are the seat of whitish, soft or horny, pedunculated nodules or excrescences, which are found either in the crypts of the tonsils, the papillæ circumvalatæ, and mucous glands, or on the surface of the mucous membrane. They are very resistant, are easily re-formed, cause but slight local disturbance, and only very rarely an inflammatory reaction. In one half of the cases the tonsils alone were affected; in most cases the disease was bilateral. It is seen in both sexes and at all ages. This affection may be mistaken for diphtheria, follicular angina, and the formation of calcareous concretions in the crypts. It differs from the first-named disease by the absence of febrile symptoms and other constitutional disturbances; from the second in the absence of fever and its greater resistance; from the third it can only be distinguished on microscopical examination. This shows in the particles the presence of numerous leptothrix rods embedded in a finely granular mass, both of which are stained blue by Lugol's solution. (Following this is a minute statement of the still mooted points with regard to the nature and growth of this fungus.) In nearly one half of the cases this affection causes no trouble whatever, and in the other only insignificant local disturbances, but no constitutional trouble. In cases in which such were present they were probably caused by too active treatment. Therapeutic measures are but seldom called for. The removal of the tonsils, or destruction of the foci with the galvano-cautery, and the avoidance of all irritating applications is all that is needed in any case. In a case which had led to various diagnostic errors the disease yielded rapidly to the smoking of segars.

41. BENSCH describes the manner in which he attaches Volto lini's palate hook to Asch's tongue depressor.

REVIEWS.

The Diseases of the Ear and their Treatment. By ARTHUR HARTMANN of Berlin. Second revised and enlarged edition. Berlin, 1884. Reviewed by Gustav Brunner, of Zürich.

The necessity of a second edition within the short period of two years is probably the best possible evidence that the book under review, with its concise and yet abundant and lucid statement as compared with the more exhaustive text-books, has supplied an actual need. In this edition the author has endeavored to fill here and there a vacancy and to keep abreast with the advances since made, without destroying the compendious character of the book (240 pages instead of 210 in the first edition), and in this I am pleased to say he has succeeded admirably. There is scarcely a chapter in the book that has not been corrected, and a new one on the prevalence, ætiology, and prophylaxis of ear diseases has been added. Paper, print, and illustrations are very good, and the book can be recommended to students and general practitioners as an excellent compend of otology.

A Treatise on the Diseases of the Ear. By Dr. VICTOR URBANTSCHITSCH. Second, entirely re-written, edition. With seventy-three wood-cuts and eight plates. Vienna and Leipzig, 1884: Urban & Schwartzberg. Reviewed by J. Gottstein of Breslau.

The favor with which Urbantschitsch's "Treatise on the Diseases of the Ear" was received on its first appearance will, in our opinion, be bestowed in an undiminished measure on its second edition. Severe objectiveness, lucid, transparent statement, and complete mastery of the rich material are qualities which create a favorable impression and secure a thorough success.

The arrangement of the subject-matter is, on the whole, the same as in the first edition, but the marginal headings are omitted, and

a complete statement of the sources of the quotations from the works of other authors given in the text is given in the foot-notes. We regard these changes as advantageous, yet believe that the author has with too great minuteness referred to all that has been thought and written in our science, and that it would have been better if much of what is worthless and discarded had been allowed to pass into oblivion. Whilst the author's endeavor to do justice to the work and the performances of others is worthy of acknowledgment, we could have wished, also, that the author had more clearly defined his own position on many questions; frequently one is in doubt whether he only gives an historical statement of the opinions of others, or whether he adopts them as his own. The author's experience is so large, and the reputation he has gained by his scientific work so excellent, that a little more subjectivity would have given his book a greater charm. Why the author has omitted the brief yet sufficient description of the rhinoscopia anterior and posterior contained in the first edition, and in this edition dismisses the subject in a few words, accompanied by an illustration of the rhinoscopic image and the nasal speculum, we cannot understand. He recognizes full well the importance of the affections of the nose and the naso-pharyngeal space with reference to diseases of the ear; he devotes two well-written chapters to the general therapeutics as well as the special pathology and treatment of the diseases of the nose and the naso-pharyngeal cavity; nay even the vignette on the title-page of the book represents, in a measure, as a token of the intimate relations existing between ear-affections and the diseases of the nose, a rhinoscopic image, and yet no directions are given for the examination of these cavities. This, it seems to us, is unjustifiable.

No less do we miss in this edition the scheme for recording the examination of patients, as it presented an easy survey, especially to beginners, of all the points to which, in the examination of patients, especial attention should be given. The directions for dissecting the ear are also wanting.

In the special part of the book the author has with painstaking care, embodied the writings of others which have appeared since this book was first published. We can call attention to only a few points of the rich material.

The author has abandoned early incisions in acute inflammations of the external canal, as he has become convinced that the incision, which in most cases is very painful, is usually followed neither by

marked relief nor a rapid subsidence of the inflammatory symptoms.

As regards the furunculous inflammations, we can confirm this from personal experience.

Among the means for facilitating the removal of fixed, swollen, vegetable foreign bodies from the external canal, we miss Zaufal's method of causing a reduction of the volume of the body by extracting water from it by alcohol or glycerin.

At the end of the chapter on the Eustachian tube a short account is given of the pathological conditions of the nose and nasopharyngeal space of special interest to the aurist. The anatomy and physiology of these parts have been omitted from this edition, for which we are unable to find a valid excuse. The illustration of the rhinoscopic image in this edition (fig. 56, p. 172) appears to be less accurately drawn than that which is found in the first edition (fig. 57, p. 248).

The statement, that the Reviewer, in cases of ozæna, keeps the tampons in the nose for twenty-four hours, is erroneous. He leaves them there only from two to six hours, according to the severity of the case, and, if necessary, introduces them several times a day.

For the removal of nasal polypi the author recommends the galvano-caustic snare, "and only in the absence of a galvano-caustic battery are the polypi to be removed by the simple snare instead of forceps which cause much more pain." We prefer for almost all cases the simple snare to the galvano-caustic loop. If the author means to say that a speculum is not always required for the operation, we cannot agree with him, as it is impossible to guide the snare with certainty, unless the nostril is sufficiently dilated and the cavity well illuminated by the reflector.

In the chapter treating of the tympanic cavity, fig. 58 of the first edition, representing a section of a rabbit-embryo seventeen days old, intended to illustrate the development of the Eustachian tube, has been very properly omitted; likewise fig. 64 (the place for tying the carotid artery, after Albert).

Unfortunately our pathologico-anatomical knowledge of the inflammations of the middle ear is still too imperfect to base upon it a scientific or available division of the inflammations. The author in this, as in the first edition, divides the inflammations in two chief groups.

1. The superficial inflammations (simple catarrh, croupous inflammation, desquamative inflammation).

2. Deeper-seated (phlegmonous) inflammations (simple phlegmonous, purulent phlegmonous, acute and chronic, the diphtheritic inflammation).

Setting aside the term tympanitis, which aurists have very properly declined to adopt, and the use of the expression inflammation of the tympanum for inflammation of the tympanic cavity, which cannot be approved, we do not regard this division a happy one. It has neither a pathologico-anatomical basis nor a clinical one, and offers no practical advantage. How, for instance, can the croupous inflammation be separated clinically, or even pathologically, from the diphtheritic inflammation, especially when the author himself reports that croupous membranes have been found on the mucous membrane of the tympanic cavity in cases of diphtheria of the pharynx? How can the author maintain that the desquamative inflammation is an independent form of the superficial inflammations, when he concedes that it is not unfrequently (according to our experience always) associated with the deeper-seated inflammations?

For the present, we consider the classification of the inflammations of the tympanic cavity according to the nature of the secretion, as answering best the practical requirements.

The description of the phenomena of the different inflammations is clear and comprehensive; the separate symptoms receive attention according to their pathological dignity. The effect of the purulent inflammation of the middle ear on the walls of the tympanic cavity and on the adjacent parts and its influence on the general health are discussed in a striking and exhaustive manner. As regards the latter, the author believes that the purulent inflammation of the tympanic cavity assists in the development of pulmonary or general tuberculosis, while in the first edition he assumed that it might be the exciting cause of the tuberculosis.

The assumption that otorrhœa assists in the development of the tuberculosis is scarcely reconcilable with our present view of the genesis of this disease. We believe, moreover, that the otorrhœa is much more frequently the result of the tuberculosis than is generally believed at present, and we never omit to examine carefully the organs of respiration in all cases of otorrhœa, the ætiology of which is obscure. It remains for further pathologico-anatomical investigation to determine whether or not a tuberculous otitis exists.

The tenotomy of the tensor tympani in cases of contraction of

its tendon can, according to the author, produce a permanent improvement of the symptoms of vertigo and subjective noises, and sometimes also of the hardness of hearing; in other cases the effect is, however, only transient. The statement contained in the first edition, that the operation sometimes exerts a favorable influence on the ear not operated on, is not found in this edition.

With regard to the question whether the operation for opening the mastoid process is indicated as frequently as it is performed by some authors, Urbantschitsch expresses no decided opinion. This subject is, moreover, disposed of in comparatively few words.

The "inner ear" is discussed the more copiously, and in the anatomical part, and especially in the physiological portion, much might have been shortened without doing harm. The two illustrations (figs. 69 and 70) of a cross-section of a whorl of the cochlea of a Guinea-pig (!) seem to us of doubtful value to the otologist. As psycho-acoustic phenomena are briefly mentioned the results of the highly interesting experiments published by the author in *Pflüger's Archiv.*, vol. xxiv., and under the head of reflex phenomena are described the reflex excitement of the sense of hearing by the various sensory nerves, especially the trifacial nerve, on the one hand, and the effect produced by the excitement of the sense of hearing upon the sphere of motion, the vascular system, and the sense of sight on the other.

It belongs to the nature of a critical review to give prominence to such points as give occasion for opposition. We have found fault with some things, and have been unable to acknowledge as improvements some of the changes made in this edition, and therefore feel the more bound to state that, in our judgment, Urbantschitsch's book, as a whole, is fully up to the present state of our science, and that it is a thorough, careful work which will be of great service both to the general practitioner and the specialist.

The illustrations are, without exception, excellent, and paper and type are all that can be desired.

The New Editions of Roosa's' and Burnett's' Text-Books on the Ear.

In addition to the numerous new works on the ear with which the profession has been favored within the last two or three years, we have now new editions of two with which we have been familiar for some time. Particularly is this so of the work of Roosa. His name is indissolubly connected with the history of otology in America. He was among the first in this country to labor in this special field, and to add to its literature by his admirable translation of Tröeltsch's work, and afterward by his own text-book, of which the edition now before us is the sixth in eleven years.

This fact is of itself sufficient to stamp its character and show deservedly great popularity. It will also render unnecessary any consideration in detail of the contents. There is the same general excellence and simplicity of style, and the same adherence to the practical aspects of the various questions discussed, as in the former editions. The great value of his book has been that it was the record mainly of the results of his own experience, whereas the opinions of others, while noted and duly weighed, are not dwelt upon at any undue length.

It may be stated as regards some of the questions which have more recently agitated the otological world, that he has not entirely abandoned the syringe for cleansing the ear, nor liquids in the treatment of otorrhœa. He has also attempted to formulate the elements of a diagnosis between labyrinthian and middle-ear deafness, and has tried to place the tuning-fork in its proper place, as a means of differential diagnosis. Categorically stated the facts are :

Disease of middle ear :

Bone conduction better.

Better hearing in noise.

Disease of acoustic nerve—either primary or secondary :

Aërial conduction better.

¹ A Practical Treatise on the Disease of the Ear, including a Sketch of Aural Anatomy and Physiology. By Dr. D. B. St. John Roosa, M.D., LL.D., etc. Sixth edition, revised and enlarged. New York : Wm. Wood & Co., 1885. Price \$5.50.

² The Ear : Its Anatomy, Physiology, and Diseases. A Practical Treatise for the Use of Medical Students and Practitioners. By C. H. Burnett, A.M., M.D., etc. Second edition, revised and rewritten. Philadelphia : H. C. Lea's Son & Co., 1884. Price \$5.50.

Worse hearing in noise.

In all particulars the work is brought down to our present knowledge.

The first edition of Burnett's treatise was published seven years ago, and was at once received with favor. Its chapters on the anatomy and physiology were particularly good, and its references in greater or less detail to the investigations of others gave it an encyclopedic character which is of especial value to the student. These merits are retained in this new edition, which is what it pretends to be, namely, a *revised* edition. Every page has been carefully gone over, and the most of the book has been entirely rewritten, and all that has been done in otology since the first edition is given consideration. The views of the author in regard to chronic purulent catarrh of the middle ear lean rather to the dry treatment, and his opinions on all subjects while conservative are not ultra. Both works are well printed and fully illustrated.

S. M. B.

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Fig. 1

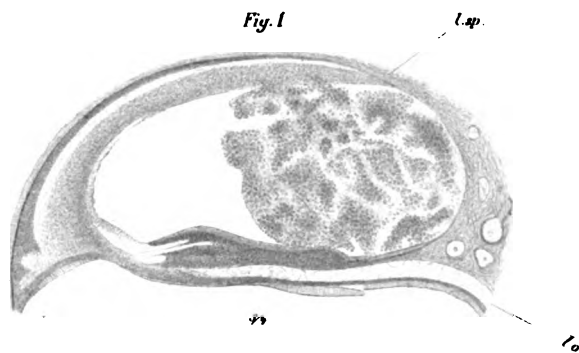


Fig. 2

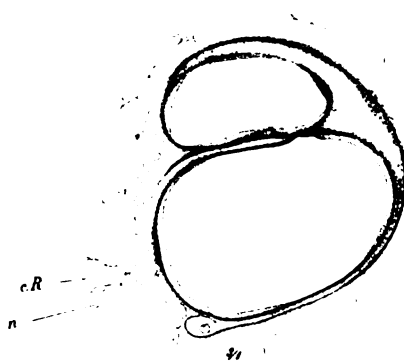
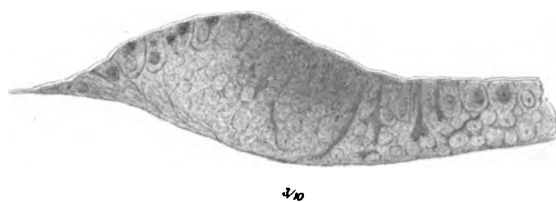


Fig. 3



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